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A. W. GREELY W J McGEE ELIZA RUHAMAH SCIDMORE

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MAP

of the valley of the

ORINOCO RIVER

showing

the extent of territory drained by that waterway and the bearing it has on the Venezuelan question.

Compiled by
T. HEYWARD GIGNILLIAT.

1896.

For description see page 92.

Scale:
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SEA OF THE ANTILLES

S. NEVADA DE STA MARTA

MARACAIBO

PUERTO CABELLO

LA GUAYRA

LA SILLA DE CARACAS

CARACAS

VALENCIA

COLON

PANAMA

PACIFIC OCEAN

VENEZUELA

COLOMBIA

Orinoco River

CIUDAD BOLIVAR

Caroni R.

BOGOTA

Orinoco R.

SIERRA DE LA PARU

BRA

XUM

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SEA OF THE ANTILLES

ATLANTIC OCEAN

S. NEVADA DE STA MARTA

MARACAIBO

PUERTO CABELLO

LA GUAYRA

CARACAS

LA SILLA DE CARACAS

VALENCIA

PORT of SPAIN

Trinidad I.

VENEZUELA

Orinoco River

CIUDAD BOLIVAR

Caroni R.

Aruamuru R.

Barima R.

Waini R.

MORA PASSAGE

EL CALLAO

Cuyuni River

ORIGINAL DISPUTED TERRITORY

GEORGETOWN

Mazaruni R.

Demerara R.

BRITISH GUIANA

Essequibo River

Berbice River

Corentyn River

COLOMBIA

BOGOTA

Orinoco R.

SIERRA DE LA PARIMA

Schomburgk Line

Blanco River

EQUATOR

BRAZIL

XUM

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T. HEYWARD GIGNILLIAT.
1896.

For description see page 92.

Scale: 0 25 50 75 100 125 150 175 200 Miles

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LA GUAYRA

LA SILLA DE CARACAS

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PANAMA

PACIFIC OCEAN

VENEZUELA

Orinoco River

CIUDAD BOLIVAR

COLOMBIA

BOGOTA

Orinoco R.

SIERRA DE LA PARIM

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Negro River

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S. NEVADA DE STA MARTA
MARACAIBO
PUERTO CABELLO
LA GUAYRA
CARACAS
LA SILLA DE CARACAS
VALENCIA
PORT of SPAIN
Trinidad I.
T I C O C E A N
MORA PASSAGE
ORIGINAL DISPUTED TERRITORY
Amakura R.
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XUM

THE

National Geographic Magazine

VOL. VII FEBRUARY, 1896 No. 2

VENEZUELA: HER GOVERNMENT, PEOPLE, AND BOUNDARY

By WILLIAM E. CURTIS,

Ex-Director of the Bureau of the American Republics

Along the Spanish main, from Trinidad to the isthmus, is a mixture of Florida and Switzerland, where one can find within the radius of a single day's journey any climate or scene to suit his taste, from a tropical jungle swarming with tigers and 'gators to mountain crests crowned with eternal snow. The Andes and the Cordilleras, forming a double spinal column for the continent, split and scatter and jump into the sea. At the very edge of the ocean, within view of passing vessels, are peaks whose snow-capped summits seem to hang in the air. The Nevada de la Santa Marta, 17,500 feet high, affords one of the most majestic spectacles in all nature. Tourists are always incredulous when the peak is pointed out to them, for it resembles a bank of clouds, but they are finally compelled to admit the truth of geography, for clouds do not stand transfixed in the sky, unchangeable and immovable, like this phenomenon.

Between these mountains and along the coast are narrow valleys of luxurious tropical verdure and a rich soil—valleys which yield three harvests annually and are densely populated. Coffee, sugar, and chocolate are the staples of the lower region, called *tierre caliente* (hot earth); corn, beans, and other products of the temperate zone are raised upon the mountain sides, and higher, seven or eight thousand feet above the level of the sea, are herds of goats and cattle.

The population of Venezuela is about two and one-half millions, not including 260,000 Indians, and there are nine states, one federal district, and five territories. The country is still in a primitive and comparatively undeveloped condition. Outside the principal cities it has made little or no progress since the yoke of Spain was thrown off, and the population is believed to be less than it was then.

Agricultural and industrial development has been retarded by political revolutions and a lack of labor and capital, but the property of foreigners who do not meddle with local affairs is seldom disturbed and the government offers liberal inducements for colonization and investment. Manufacturing establishments are almost unknown. There is little machinery in the country, and industry is generally carried on in the households and by the most primitive processes. There is an abundance of convenient water power, but fuel is scarce and expensive; therefore the future wealth of Venezuela, as well as her present prosperity, lies in the development of her agricultural resources, which are almost boundless, and her mineral deposits, which are among the richest and most accessible. Coffee is the great staple, and the product is unsurpassed.

It has been the unhappy lot of Venezuela to have been the scene of almost constant warfare. There is not a country in the world whose history is more stained with blood. She is the Hungary, the Poland, of South America. There is scarcely a city or a settlement within the limits of the republic which at some time or another has not suffered total or partial destruction, and scarcely a mountain top from which some battlefield may not be seen. During colonial times Venezuela was cuffed and kicked about by Spain so that her people were in almost constant rebellion, and since her independence was established, three-quarters of a century ago, her political leaders have kept her like an armed camp. Most of her rulers have been elected by bullets and bayonets instead of by ballots, and most of her great men have died in exile, to have their bones brought home in after years with tremendous honors and buried under monuments of marble and statues of bronze.

The president of Venezuela is assisted in the performance of his duties by a cabinet of eight members. He receives a salary of a thousand dollars a month, a house to live in, horses and carriages, servants and furniture, and, in fact, everything except his food. He conducts himself very much like the President of the

United States; his daily routine is similar, and he is annoyed by office-seekers to about the same degree. He commences business at half-past six o'clock in the morning, and often has cabinet meetings as early as seven. The government offices open at seven, when all the clerks and officials are expected to be on hand, no matter how late they were dancing or dining the night before, but they knock off work at eleven for their breakfast and siesta, and do not return to their desks again until two.

Cabinet ministers are paid $6,000 a year and congressmen $2,500, without any additional allowances, but the sessions do not last more than three months usually, so that they may engage in their regular occupations the rest of the year.

The standing army is composed of five battalions of infantry, 1,842 men; one battery of artillery, 301 men, and one regiment of cavalry, 325 strong. Besides these regulars, who garrison the capital and the several forts throughout the country, there is a federal militia which is drilled annually and required to respond to the call of the government at any time.

The rank and file of the army is composed exclusively of Indians, negroes, and half-breeds. They are obedient, faithful, and good fighters. Some of the fiercest battles the world has ever known have taken place in Venezuela with these poor fellows on both sides. Their uniform in the field is a pair of cotton drawers, a cotton shirt, a cheap straw hat, and a pair of sandals, but when they come to occupy the barracks in town and do guard duty around the government buildings they are made to wear red woolen trousers, blue coats, and caps of red and blue, with regular army shoes.

The officers are generally good-looking young fellows of the best families, who take to military service and enjoy it. They wear well kept uniforms, have good manners, and are usually graduates of the university.

The government has established a school of industry for the education of the Indian children, and every year a commission is sent to obtain recruits for the army among them. The boys are taught trades and all sorts of handicraft, as well as reading, writing, and arithmetic, and the girls are drilled in the duties of the home. When they have reached an age when their faculties are fully developed and their habits fixed they are sent back among their tribe as missionaries, not to teach religion, but civilization, and the Indians are said to be improving rapidly under the tuition of their own daughters and sons.

The chief towns of Venezuela are Caracas, the capital, and La Guayra, its seaport; Valencia, which lies upon a curious lake, one of the most interesting of natural phenomena; Puerto Cabello, where Sir Francis Drake died and was dropped into the water with a bag of shot at his heels, and Maracaibo, upon the lake of the same name, from which we get much of our coffee.

The chief seaport of Venezuela, La Guayra by name, has the reputation among sailors of having the worst harbor in the world. It is merely an open roadstead, beset by almost all the dangers and difficulties which seamanship can encounter. Even in calm weather the surf rolls up with a mighty volume and dashes into spray against the rocks upon which the town is built; but when a breeze is blowing, and one comes almost every afternoon, the waves are so high that loading or unloading vessels is dangerous and often impossible.

Between La Guayra and Caracas is a mountain called La Silla, which reaches nearly 9,000 feet toward the sky and springs directly from the sea. There is only a beach about two hundred feet in width at the foot of the peaks, along which La Guayra is stretched two miles or so—a single street. Part of the town clings to the side of the monster like a creeper to the trunk of a tree, and one wonders that the earthquakes, which are common there, do not shake the houses off into the ocean.

The distance in a straight line through the base of the mountain would be only about four miles, and a Washington engineer once made plans for a tunnel and a cable railway, but it was too expensive an undertaking. Over the dip in the saddle is an Indian trail about eight miles long, and in 1883 English engineers and capitalists built a railroad twenty-four miles long between the two places, which climbs 3,600 feet in about twenty miles, and creeps through a pass to the valley in which the capital is situated. It is a remarkable piece of engineering and offers the traveler a scenic view whose picturesqueness and grandeur have been extolled from the time the Spanish invaders came, in 1520, until now. Humboldt says there is no picture combining the scenery of the mountains and the ocean so grand as this, except the peak of Teneriffe. It is as if Pike's peak rose abruptly from the beach at Long Branch.

There is nothing Indian about Caracas except its name, and it is one of the finest cities in South America. The climate is superb, being a perpetual spring, the thermometer seldom rising above 85 degrees and seldom falling below 60; there is not a

LA GUAYRA—FROM THE EAST.

stove, nor a fireplace, nor a chimney in the town; there is no glass in the windows; the nights are always cool, and in the daytime there is a difference of ten or twelve degrees in temperature between the shady and the sunny sides of the street.

In 1812 the city was entirely destroyed by an earthquake and twenty thousand people were killed. It came on Holy Thursday, when the citizens were preparing for the great religious fiesta of the year. There was not a cloud in the sky and not a thought of danger in the minds of the people, when suddenly the town began to rock, the church bells tolled voluntarily, and a tremendous explosion was heard in the bowels of the earth. In a second the city was a heap of blood-stained ruins and the air was filled with shouts of horror and the shrieks of the dying.

There have been several earthquakes since, attended with serious casualties, and while the people profess not to fear them they build the walls of their houses three and four feet in thickness and seldom make them more than one story high.

The people of Caracas have an opera supported by the government, a university, art galleries, public buildings that are beautiful and expensive, and homes in which one can find all the evidences of a refined taste that are known to civilization. While in some respects the people are two hundred years behind our own, and while many of their manners and customs appear quaint and odd when judged by our standard, there is no social station in America or Europe which the educated Venezuelan would not adorn. Their women are proverbial for their beauty and grace and their men for their deportment.

There is no convenient way of getting from Caracas to the Orinoco country except by sea. Of course, one can "cut across lots," and many people, armies, indeed, have gone that way, but it is a long, tedious, and difficult journey, and dangerous at times, because of the mountains to be climbed, the forests to be penetrated, the rivers to be forded, and the trackless swamps. To a naturalist the trip is full of fascination, for the trail leads through a region prolific with curious forms of vegetable and animal life.

To reach Ciudad Bolivar, formerly known as Angostura, the political capital as well as the commercial metropolis of the Orinoco country, is neither difficult nor expensive, and, aside from the heat, the journey is comfortable. It is like going from New York to Memphis by sea, however, although not so great a distance. There are no native means of transportation, but you can

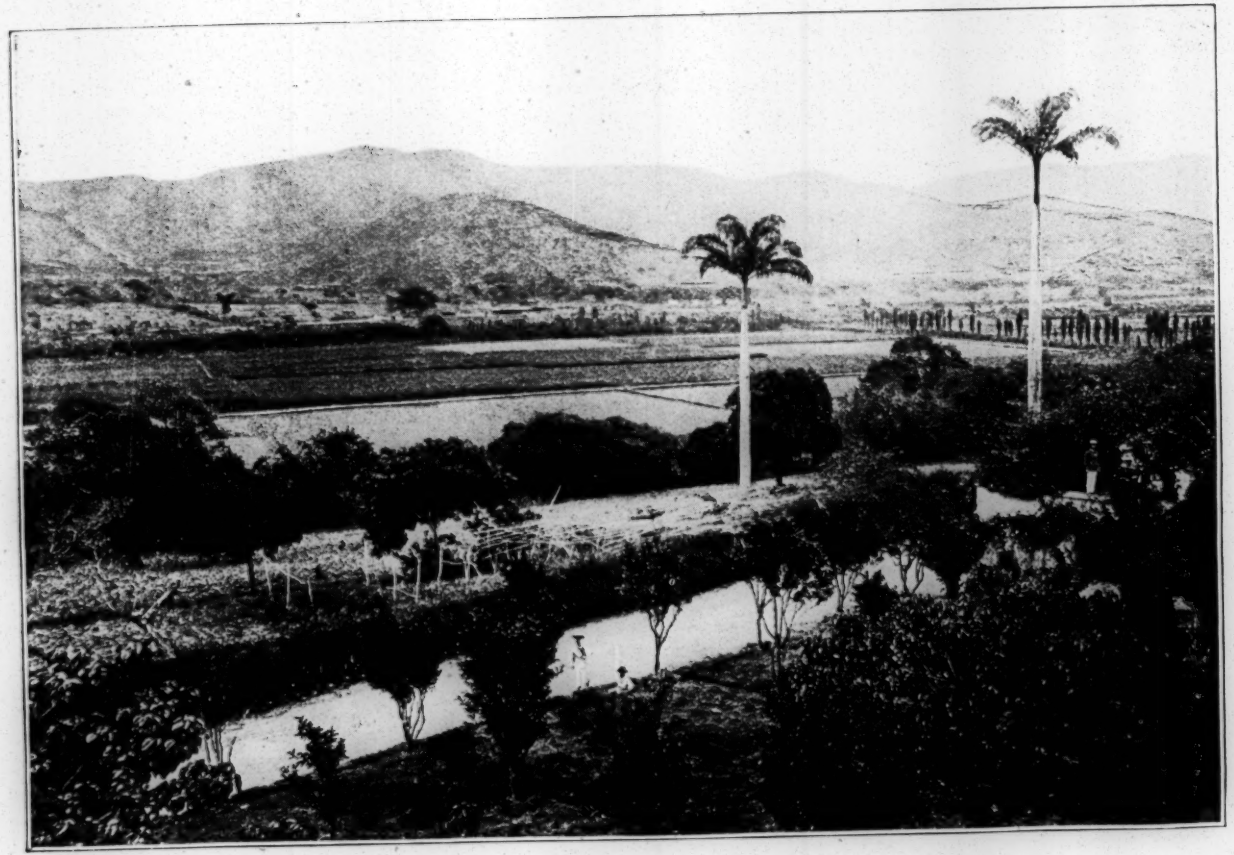
take any of the English, French, or German steamers, and they are usually leaving La Guayra as often as twice a week to Port-of-Spain, on the British island of Trinidad. At least once a week, and generally twice, a steamer leaves Port-of-Spain for the upper Orinoco. The time required to make the journey depends upon the season of the year and the condition of the river. If you are going during the rainy season—that is, from the first of May to the first of November—you can reach Ciudad Bolivar in three days; but during the dry season, when the river is low, navigation is slow and difficult because of snags, bars, and other obstructions. At Ciudad Bolivar the traveler shifts his baggage to a smaller craft, similar to those that ply the Ohio, Tennessee, and other streams of the United States, and starts onward for the head of navigation, wherever that may be.

It is possible to go within two days' journey on mule-back of Bogota, the capital of Colombia, by taking the Meta, one of the chief affluents of the Orinoco, and by passing southward through the Cassiquiare the Amazon can be reached. Few people are aware that a boat entering the mouth of the Orinoco can emerge again into the sea through the Amazon without leaving the water. This passage is not navigable for large steamers because of rapids and obstructions, but it might be made clear at an expense that would be very slight in comparison with the advantages gained.

Another branch goes nearly to Quito, the capital of Ecuador, and in fact its affluents are so numerous and so large that in all the five hundred thousand square miles of territory drained by the Orinoco there is scarcely a point more than three or four days' journey by mule from navigable waters, and there are said to be four hundred and thirty navigable branches of the river.

From the Atlantic to the Andes, from the chain of the Cordilleras that hugs the coast of the Caribbean to the legend-haunted Sierra de la Parima, there is an area as large as the valley of the Mississippi, and similar in its configuration, capable of producing mighty crops of nearly everything the world feeds on, and affording grazing ground for millions upon millions of cattle. From the foothills of the mountains in which the sources of the river are, two thousand miles to the sea, are great plains or llanos, like those of Iowa and Illinois, almost entirely destitute of timber, except along the courses of the rivers, where valuable trees are found.

The scenery for the greater part of the voyage is interesting, but as you reach the upper waters and enter the foothills of the



VALLEY OF CARACAS, EAST OF THE CAPITAL, WITH COFFEE AND SUGAR PLANTATIONS.

XUM

Andes it becomes sublime; but there steam navigation ceases, and canoes paddled by Indians are the only means of transportation. The heat along the lower river is intense, but the boats are built so as to protect the traveler from the sun and afford the greatest degree of coolness possible. The water is turbid and muddy; the banks are low, and the Orinoco, like the Missouri, often tires of its old course and cuts a new one through fields or forest; on either side the coarse grass and reeds grow tall, and toward the end of the season are topped with tassels that nod and droop in the sun.

At daybreak long lines of pelicans and other water birds awakened by the breathing of the steamer go clanging out to sea, and as morning wakens, the thin blue mist that nature nightly hangs upon the river rises and leaves the slender rushes that line the banks to quiver in the burning glare. Toward noonday a breeze springs up, which is as regular and faithful as the stars; it cools the atmosphere, covers the surface of the river with pretty ripples, and makes life possible under a tropic sun. There is no twilight; the sun jumps up from below the horizon in the morning and jumps down again at night, and then for a few moments the sky, the river, and the savannahs are one vast rainbow, livid with colors so spread and blended that the most unpoetic eyes cannot behold it without admiration and awe.

The smaller streams are sheltered by flower-bespangled walls of forest, gay with innumerable insects and birds, while from the branches which overhang them long trailers droop and admire their own gorgeousness in nature's mirror. Majestic trees whose solitude was undisturbed for centuries are covered with decorations that surpass the skill of art; their trunks and limbs concealed by garlands finer than were ever woven for a bride—masses of scarlet and purple orchids, orange and crimson, blue and gold—all the fantastic forms and hues with which nature bedecks her robes under the fierce suns and the faltering rains of the tropics.

The only place of real importance, the entrepôt of all commerce, the headquarters of all trade, the source of all supplies, and the political as well as the commercial capital of nearly half of the republic of Venezuela, is Ciudad Bolivar. It has about 12,000 inhabitants, representing almost every nation on earth; it is built upon a clay bluff about seventy feet above high-water mark, so that it is in no danger of being swept away. During the six months of dry season, when the water is low, most of the ship-

ping business is transacted upon the beach. The government has concentrated at Ciudad Bolivar the civil and military authority. It has the only custom-house upon the entire Orinoco system and practically the only courts.

The city resembles other Spanish-American towns, for they are all alike, has a number of pretty foliage-shaded squares, several rather imposing government buildings, a cathedral, a public market, a theater, a college, and the inevitable statues of Bolivar, the liberator, and Guzman-Blanco, the regenerator of Venezuela. The volume of business done there is enormous in proportion to the population, as it is the supply point and the port of shipment for a large and productive area. Within the last few years the exports of gold alone from that little town have been valued at $39,000,000. The principal merchants are Germans, the restaurant keepers are Italians, and the laboring classes are negroes from the West Indies or Canary islands. Ships from all ports in the world land at the piers, and the flags of every nation may be seen floating from the poles on the house-tops. The manufacture of cigars is extensive, as excellent tobacco is cultivated in the neighborhood, and in almost every household the women employ their spare time rolling the leaves into what are known in the nomenclature of North America as "Wheeling stogas." These are used in amazing quantities by the negro roustabouts, and are sent down the river to Los Tablas, from whence they are carried on mule-back 150 miles into the interior to the mines.

The most profitable mine in Venezuela, and one that is famous all over the world, is El Callao, situated on the borders of the disputed territory, in the state of Bolivar, about one hundred and fifty miles south of the Orinoco river.

I suppose that the richest gold mine ever discovered was the Consolidated Virginia, the mine from which so many of the California mining kings drew their enormous fortunes. It is difficult to calculate the output of the old Spanish mines in South America, but El Callao is reckoned second to the Consolidated Virginia in the amount of gold produced, and I understand that it has already produced more "free gold" than any other ever opened. It was worked by the Indians long ago; at least its location corresponds with that of a legendary deposit from which the savages of Venezuela got much of the gold taken from them by the Spaniards, but after the latter took possession of the country its existence was a matter of much doubt, until four Jamaica negroes happened to run across it on a prospecting tour.

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VALLEY OF CARACAS, WEST OF THE CAPITAL, WITH PLANTATIONS AND SUGAR FACTORY.

Three agreed to sell their share in the discovery to a party of Corsicans for a nominal price. The fourth negro decided to keep his interest, and has always been glad that he did so, for within the next two or three years he was able to return to his native island, where he has since lived like a nabob at the city of Kingston, the richest man in Jamaica.

The Corsicans, when they began to realize the value of the property, sent two of their number to England, and succeeded in raising sufficient money to build a stamp-mill and introduce other necessary machinery; but they did not capitalize their company at ten or twenty millions of dollars, as is customary in the United States, nor did they put any of their stock on the market. They issued only thirty-two shares, which were sold originally at $2,500 a share cash, making their entire capital $80,000. These shares have since sold for half a million dollars each, at which rate the mine would be worth $16,000,000; but most of them are still in the possession of the original subscribers.

There is little immigration and labor is scarce. Most of the miners are negroes from Jamaica, Trinidad, and other West India islands. They appear to be the only class of human beings who can endure the climate, for the land is low and the mines are situated almost directly on the equator. The country is comparatively healthy, but the rays of the sun are intense, and until a man becomes acclimated he is easily prostrated by exposure. Wood is the only fuel, and a very poor quality costs seven dollars a cord.

Some of the mines are within and some without the territory claimed by England, but Great Britain has two gunboats upon the Orinoco, and at the first possible excuse will take possession of the entire mineral district. Such an act would be audacious, but would be heartily welcomed by the people, who would very much prefer an English colonial government to Venezuelan rule. I have been told by dozens of men—Americans, Germans, native Venezuelans, and representatives of other nations—that if the question were submitted to the miners the decision would be almost unanimously in favor of England. The most popular and populated diggings are on the Barima river, in the disputed territory, where several million dollars of foreign capital, mostly British, is invested, and some twenty thousand miners are at work.

The colonial authorities of Guiana have calmly occupied this territory, organizing police, appointing local magistrates, assuming legislative as well as executive jurisdiction, providing laws

and regulations for the government of the mining camps, requiring prospectors to obtain licenses from the colonial officials at Georgetown before commencing work, and to advertise their claims and locations in the Official Gazette of the colony.

These regulations have been imposed by the British colonial authorities within a territory to which they did not claim ownership until the discovery of gold, and over which they did not attempt to exercise jurisdiction until 1883; and as new mines have been discovered they have gradually pushed their frontier line westward until it now includes nearly twice as much territory as they claimed twenty years ago and seven times as much as was ceded to Great Britain by Holland in 1814. It is true that the Venezuelans have shown no enterprise or activity in developing their own resources. They have permitted foreign prospectors to enter and occupy the mining districts at their will, and have never attempted to exercise police or even administrative control in the mining camps. The original prospectors, being Englishmen, naturally looked to the colonial government at Georgetown for protection, and the other foreigners fell in without a question, acknowledged British sovereignty and obeyed British law.

It was within this disputed territory, between the Orinoco and the Amazon, that the ancient voyageurs located the mythical city of Manoah, the El Dorado upon which the wonder and greed of two centuries were concentrated. Tidings of its barbaric splendor were brought home by every voyageur, and each caravel that left the shores of Europe carried ambitious and avaricious men, who hoped to share its plunder before their return to Spain; but the alluring El Dorado was not a place; it was a man. The term signifies "the gilded," and was originally applied to a mythical king who every morning was sprinkled with gold dust by his slaves. The nuggets of gold and the rudely wrought images which Sir Walter Raleigh laid at the feet of Queen Elizabeth when he returned from his exploration of the Orinoco doubtless came from the now famous mine of El Callao. But the El Dorado was never found; no courage could overcome, no persistence could discover, what did not exist, and the fabulous king of the fabulous island still sits on his fabulous throne, covered from his fabulous crown to his fabulous sandals with the fabulous dust of gold.

[NOTE.—The foregoing article is an abstract of a lecture delivered before The National Geographic Society by Mr Curtis, January 10, 1896. The lecture itself consisted of selected extracts from Mr Curtis' book, "Venezuela: A Land Where it's Always Summer," which will shortly be published by Harper & Brothers.]

THE PANAMA CANAL ROUTE

By Robert T. Hill,

United States Geological Survey

Within the space assigned to me for the discussion of the most unpopular of the three rival isthmian routes, I can do little more than present a brief summary of the facts concerning the Panama canal. At the outset it may be stated that if the Nicaragua route could be exclusively controlled by the United States, even if it was far more costly, my personal preference would be for it. In no case, however, does such personal preference necessitate or justify misstatements as to the rival Panama route, concerning which, since it was allowed to pass out of American control into the hands of the French and to become involved in serious financial difficulties, public opinion in this country seems to be singularly misinformed.

That this route is in control of a foreign power; that it is a rival enterprise to one supposedly controlled by a private corporation in which American citizens and officials are interested, and that it has fallen into ill repute through scandalous mismanagement are facts which are undeniable.

These questions of administration have, however, little to do with the purely scientific problem of what constitutes the most feasible route for uniting the two oceans by a maritime canal. Some patriotic Americans, while admitting that national prejudices draw them to a preference for the rival route, can yet see the arguments on both sides of the question and can distinguish the proposition that the financial failure of the Panama Canal Company in Paris is no condemnation of the feasibility of the Panama canal route.

The engineering investigations that have been conducted since the practical suspension of operations on any extensive scale on the canal itself have been singularly overlooked. At least three thoroughly equipped corps of engineers have resurveyed the entire route and recommended modifications in the plans. The reports of two of these commissions describing the improved lock-level system are in print. The third and more recent commission was engaged in studying the canal during my visit to the

isthmus in January, 1895. It comprised a large and competent body of skilled engineers, and my final word must be held in reserve until this commission has made its report.

In the meantime, what are the principal facts concerning the feasibility of the Panama route?

1. It is the shortest of all, being only 42½ miles from sea to sea, across about 20 miles of which the canal has been completed to 28 feet below sea level, making the actual present distance between the two oceans less than 25 English miles, or about one-seventh of the actual distance (170 miles) to be overcome between Greytown and San Juan in the case of the Nicaragua route.

2. It is the only possible tide-water route in the whole isthmian region. To accomplish it would, it is true, require great engineering and constructional feats, but in no respect impossible ones.

3. It is said by competent and reliable engineers to be feasible for a lock-level route. The plan proposed involves the construction of a dam at Bujio or San Pabloa of about the same size as that which is admitted to be necessary at San Carlos on the Nicaragua route, together with six locks. The construction of this dam would create a summit lake 125 feet above tide water and 12 miles in length if placed at San Pabloa, or 21 miles if located at Bujio. In addition to giving free summit navigation, such a lake would control the floods of the Upper Chagres, storing them in the rainy season and supplying water to the summit lock-levels.

4. It is in a region comparatively free from seismic disturbance and one in which no volcanic action has occurred since late Tertiary time. The Nicaragua route is within a zone of topographically destructive volcanic disturbance, where earthquakes are frequent.

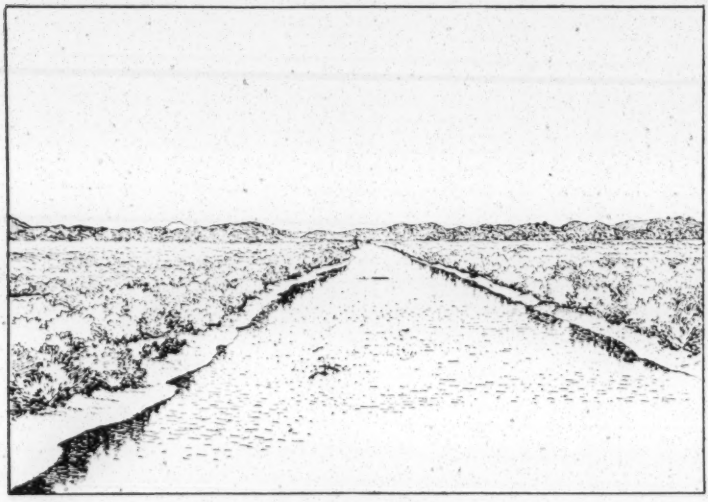
5. It has what no other route possesses: excellent terminal harbor facilities, with anchorage at both oceans so improved that ships can enter and leave at will.

6. It has been minutely surveyed. Every foot of the "trace" has been cleared of vegetation and partially excavated and tested by borings, so that the actual problems of construction are approximately known. As to problems that will surely arise in the work on the other route we have absolutely no data.

7. It has on the Caribbean side only 31 miles of flooded thalweg

(21 of the Chagres and 10 of the Obispo) to be threaded and controlled, against 111 miles in the case of the rival route. It is true that the Nicaragua route proposes to avoid a part of the San Juan by a cut of 40 miles, but the control of the remainder will be a similar and probably as serious a problem as that presented by the Chagres. From 10 to 15 miles of the latter have been completely diverted and the remainder can be controlled by the proposed summit-level lake. In the case of a sea-level plan the diversion would still be a great problem, but by no means an insurmountable one.

8. It will be the cheapest route to construct. The plant already furnished, with two-fifths of the excavation now completed for a



PANAMA CANAL,

SHOWING A PORTION OF THE 13½ MILES COMPLETED ON THE CARIBBEAN SIDE. WIDTH, 80 FEET. TOPOGRAPHY OF CENTRAL PORTION VISIBLE IN BACKGROUND.

sea-level route, including expense of administration and machinery, has actually cost $150,000,000. Upon this basis it is estimated that the entire length of 42½ miles will cost $116,000,000 more upon the lock-level plan. A sea-level route would cost $200,000,000 more. The amount of work necessary to complete the Panama canal is far less than would be required to construct the Nicaragua route. Engineers admit that 40 miles of excavation—almost equivalent to the entire length of the Panama canal—are necessary along the rival route. What the cost of the

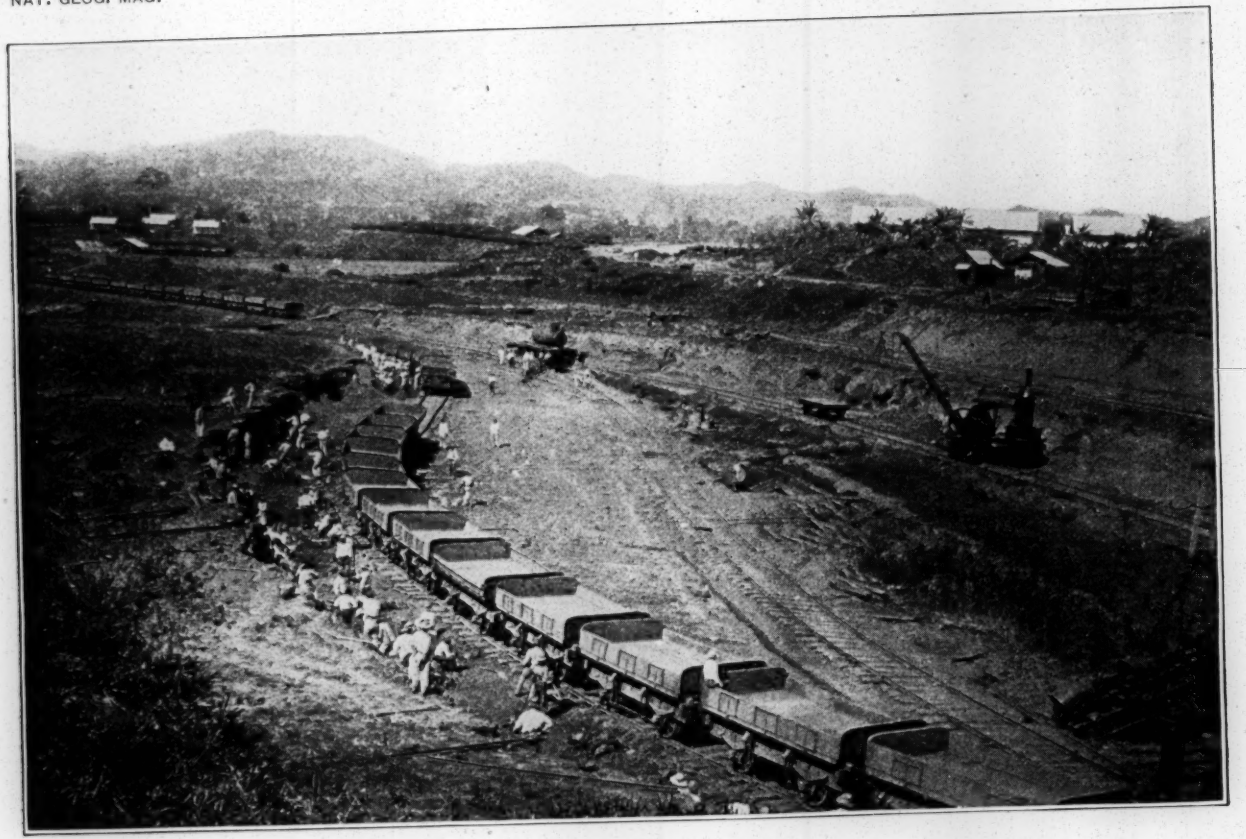
construction of the Nicaragua route will be can never be told until the actual work is well under way.

9. It is nautically the most important route, being more centrally situated relatively to the two continents. Its Caribbean terminus is as near by sailing and steaming routes both to the North Atlantic and European ports as is Greytown, while its Pacific terminus is far more convenient to the South American trade.

10. Politically it is the only route at present possessing treaty rights under guaranteed neutrality with any isthmian country by which canal construction can be permitted. The region through which it passes is American in interest and practically under our protectorate, and a neutral canal across it, even though the French construct it, would give us all the privileges now apparently to be obtained via Nicaragua under the Bulwer-Clayton treaty.

The foregoing are the salient facts concerning the Panama route. An important point to remember is that underground conditions, both favorable and unfavorable, and which were not anticipated from the preliminary surveys, have been encountered in the course of construction. For instance, the 25 kilometers of the canal on the Caribbean side were contracted for and paid for as rock-cutting, when the material proved to be, for the most part, the easiest kind of earth excavation. On the other hand, an utterly unlooked-for obstacle developed in the creeping of the clays for about a mile along the Culebra summit. These are geological considerations with regard to which we have absolutely no information along the Nicaragua line, and it is urgently needed.

Although not essentially pertinent to the subject of feasibility, a few words concerning the actual present status of the canal construction may be of interest. The company has passed through the ordeal of experimentation and financial failure and its affairs are now in the French courts, under whose direction accurate researches have been prosecuted during the past year to ascertain the exact expenditures of the late company and to determine what steps are necessary to complete the work. Upon the report of the commission will depend the completion of the canal. The French people have put too much money into the enterprise not to complete it, and Americans need not deceive themselves with the expectation that the work is abandoned or that the company is utterly bankrupt. Almost the entire plant, including dredges,



CONSTRUCTION WORK ON THE PANAMA CANAL, NEAR THE SUMMIT, IN 1895.

Photographed by Robert T. Hill.

railway locomotives and other machinery, track, barges, steam vessels, pontoons and locks, houses, shops, etc., for the completion of the work is on the ground, and this alone represents a large proportion of the money expended by the old company. This plant is not undergoing the ruinous decay that has been represented in this country, but, on the contrary, it is kept in scrupulously good order and will be available for the completion of the work.

The old Panama Company was responsible for nearly $266,000,000, of which it spent $150,000,000 upon the plant and construction and criminally distributed nearly $100,000,000 among the dishonest parties who brought the company into disrepute. In the hands of the courts, however, there still remains some $20,000,000 awaiting the reorganization of the company. That the present commission does not consider the route impracticable is attested by the fact that they have kept the work progressing, about 2,000 laborers having been employed upon the construction of the canal during the past year. When, in February, 1895, I took the photograph reproduced as an illustration to this article I counted five locomotives at work carrying away the excavations from the Culebra summit.

No available news comes to this country from France concerning the operations of the canal. *The Outlook*, however, in a recent issue, makes the following statement:

"It was announced recently that the French company in charge of the work on the Panama canal is now collecting 2,000 more men from Jamaica and other West Indian islands to add to the 1,800 now at work, and that it is intended eventually to increase the force to 6,000 men. The New York *Evening Post* declared that it had received information which it considered trustworthy that the money to finish the work on the present plan has all been furnished, and that nothing can prevent the opening of the canal at the appointed time, except accidents and obstacles not now anticipated. The managers even expect that the work will be completed in six years. This is quite in line with the report made by Sir Henry Tyler, the late president of the Grand Trunk railway, who has been visiting Panama. He says that it is proposed to construct two large dams, one across the Upper Chagres and one on the Lower Chagres river. Two lakes will thus be formed, the upper one supplying water to the higher portion of the canal, while the lower one will be mainly used to furnish water for the navigation of the lower part. Ten locks will be built, enabling the canal to reach a height of 170 feet above the sea level. Sir Henry holds that there is no insuperable difficulty in the completion of the canal in six years, at a cost of $100,000,000, by utilizing the work already done for a distance of sixteen miles from Colon and four miles from Panama."

XUM

COMPARATIVE TABLE: NICARAGUA AND PANAMA ROUTES.

	Nicaragua.	*Panama—Lock-level plan.*
Natural distance, sea to sea.....miles..	169.5	42.5
Present distance, sea to sea.....miles..	169.5	25
Natural altitude, continental pass.....feet..	147	260
Same, as reduced by artificial cutting..feet..	147	246
Miles of river course, Caribbean side.....	111	31
Miles of river course below site of proposed dams.....	32	21
Proportion of above diverted by artificial cutting.....	.....	10
Proposed height, summit level.....feet..	110	125
Proposed dams to create summit level.....	1	1
Miles of proposed summit navigation.....	144.8	12 or 21
Proposed locks.....	7	6
Excavation (miles originally proposed).....	40.3	42.5
Miles of excavation completed for lock plan.	0	15–20
Miles of excavation to be completed for lock plan.....	40.3	10[1]
Terminal harbors.....	None.	Completed.
Plant on ground for completion.....	.....	All.
Estimated cost to complete canals.....	$133,500,000[2]	$116,000,000

[1] The adoption of the lock-level plan will avoid several miles of excavation originally contemplated in sea-level plan. [2] U. S. Commission.

THE TEHUANTEPEC SHIP RAILWAY

By Elmer L. Corthell, C. E., D. Sc., etc.

The world is still discussing the question of the best route by which to facilitate interoceanic traffic between the Atlantic and the Pacific. Commercial interests now center on three routes—Panama, Nicaragua, and Tehuantepec. The first has entailed enormous expenses on France and involved many of its prominent citizens in serious complications; the second has been specially urged on the United States as the American route; the third, advocated for many years by a great genius, has been advanced to such a stage by Mexico as to be the only work that present conditions have justified.

Addressing ourselves to the advantages of the Tehuantepec route, its interesting constructive, commercial, and geographic features must be prefaced by a brief historical résumé. The

Mexican republic in 1824 invited proposals to open the isthmian route, but internal dissensions delayed action. In 1842 Santa Anna granted a charter to José de Garay, but the only tangible result was the complete survey of the isthmus by Gaetano Moro, an able Italian engineer. In 1850 efforts to negotiate treaty rights for the United States in this respect failed; but by the Tehuantepec Railroad Company, chartered by Mexico, exhaustive surveys of the route were made, under the direction of Gen. J. G. Barnard, U. S. A., by Mr J. J. Williams, whose report of 1852 is the most complete ever published. In 1868 the Louisiana Tehuantepec Company conducted a large transportation business of freight and passengers over a partly built wagon road, but its charter of 1857 was soon forfeited. The life of the La Sere grant of 1867, nullified in 1879, was marked by the active interest of the United States in the problem of interoceanic communication. In 1870 Commodore Shufeldt, sailing with an able corps of army and navy assistants, exhaustively surveyed Tehuantepec and Nicaragua, and in his report strongly advocated the Tehuantepec route for its many advantages. Mexico coöperated in an independent survey under Señor M. F. Leal, now her secretary of public works.

It was President Diaz who initiated railroad construction and has so earnestly persisted in efforts to open an international route across this isthmus. Under the charter of 1878 Mr Edward Learned, an American, constructed 22 miles, receiving a subsidy of $12,000 per mile, but in 1882 he surrendered his charter to the Mexican government, receiving, by arbitration under charter provisions, $125,000 in Mexican silver and $1,500,000 in gold. These futile private efforts led Mexico to undertake the work herself; but she soon reverted to the contract system, and under Mr D. Sanchez, a Mexican, some miles of track were laid on the Atlantic and Pacific sides at an expense of $1,434,135 in Mexican silver. In 1882 a loan of £2,700,000 was negotiated, and Mr E. McMurdo, of London, contracted to repair the track built and complete the road proper. Much work was done, but Mr McMurdo died and the contract was abrogated, the company having failed to comply with its terms. Some $2,000,000 of Mexican silver remained, and with this sum and an additional appropriation of $1,111,035 in silver Messrs C. S. Stanhope, J. H. Hampson, and E. L. Corthell completed the railroad in 1894. Mexico now operates it and is spending $1,000,000 in gold, under a contract with Mr S. Hermanos, to perfect the equipment and finish

some permanent structures. Since 1878, including the last contract and excluding interest, Mexico has spent on the route $16,000,000 in gold and $2,670,170 in Mexican silver.

The completion and operation of this railroad will greatly facilitate the construction of the ship railway when the time arrives to build it, as it may with great advantage be employed to distribute supplies, materials, and laborers along the line of the ship railway, and thus be used as an auxiliary line, which Mr Eads had intended to build in advance for this purpose.

Permit me now to state the part taken by Mr Eads in solving the problem of interoceanic transit. In a letter to the New York *Tribune*, June 10, 1879, he advocated a ship railway at Panama instead of a ship canal. As against the doubtful project of a ship canal and in favor of a ship railway he said:

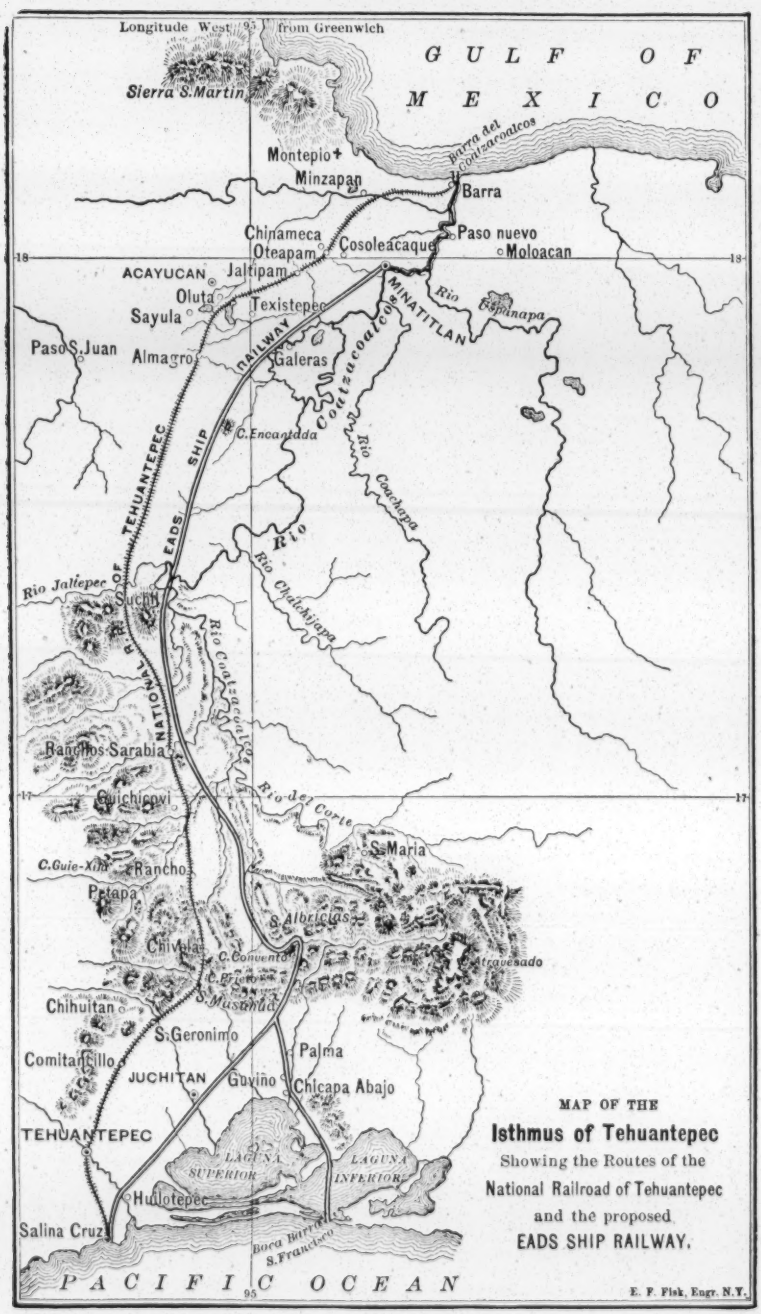
> "My own studies have satisfied me of the entire feasibility of such transportation by railroad, and I have no hesitation in saying that for a sum not exceeding one-third of the estimated cost of the canal, namely, about $50,000,000, the largest ships which enter the port of New York can be transferred, when fully loaded, with absolute safety across the isthmus, on a railway constructed for the purpose, within twenty-four hours from the moment they are taken in charge in one sea until they are delivered into the other, ready to depart on their journey."

He urged the construction of a ship railway on De Lesseps, but the great Frenchman said, "A canal at sea level or nothing." He found nothing, at a cost not of $120,000,000, but of $250,000,000.

Mr Eads then turned his attention to the much more advantageous route at Tehuantepec, only 800 miles from the Mississippi jetties, and it was my good fortune to be henceforth associated with him until his death.

The concessions of May, 1881, modified in 1885, provided for the construction and operation of the ship railway for 99 years. Many liberal provisions were included, such as the donation of about 2,700,000 acres of land, ample rights of way, right to collect tonnage and wharf dues. Far the most valuable grant was the guaranty that one-third of the net revenue of the company for fifteen years from the opening of the railway should amount to $1,250,000, with the right to secure a similar guaranty for $2,500,000 to cover the remaining two-thirds of the interest from foreign nations, but with the understanding that this guaranty should be sought from the United States.

Mr Eads made the plans with his customary skill, and after obtaining the approval of many prominent naval architects and


Longitude West 95 from Greenwich
GULF OF MEXICO
Sierra S.Martin
Barra del Coatzacoalcos
Montepio
Minzapan
Barra
Chinameca
Oteapam
Cosoleacaque
Paso nuevo
Moloacan
ACAYUCAN
Jaltipam
Oluta
Sayula
Texistepec
Paso S.Juan
Almagro
Galeras
RAILWAY
MINATITLAN
Rio Tepinapa
Coatzacoalcos
C.Encantada
Rio Coachapa
TEHUANTEPEC SHIP
Rio Chalchijapa
Rio Jaltepec
Suchil
Rio Coatzacoalcos
NATIONAL R.R. OF
Rancho Sarabia
Guichicovi
Rio del Corte
S.Maria
C.Guie-Xiña
Rancho
Petapa
S.Albricias
Chivela
C.Convento
C.Piedras
S.Mustiado
Chihuitan
S.Geronimo
Comitancillo
JUCHITAN
Guviño
Palma
Chicapa Abajo
TEHUANTEPEC
LAGUNA SUPERIOR
LAGUNA INFERIOR
Hullotepec
Salina Cruz
Boca Barra S.Francisco
PACIFIC OCEAN
95
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MAP OF THE
Isthmus of Tehuantepec
Showing the Routes of the
National Railroad of Tehuantepec
and the proposed
EADS SHIP RAILWAY.
E. F. Fisk, Engr. N.Y.

engineers came to the United States Congress with a bill for the charter contemplated in the Mexican concession. Scarcely two months later the promoters of the Nicaragua canal came before Congress with a somewhat similar measure, and the two projects antagonized each other up to the death of Mr Eads, in 1887.

Meanwhile the most exhaustive surveys were made and a satisfactory route was laid down between the ocean terminals of the isthmus. The requirements of the charter as to beginning construction work were fully complied with, and the amount of construction work done by Mr Eads will be best appreciated by the statement that about $500,000 in gold was expended.

From the Tehuantepec railroad to the Panama railroad, measured along the Pacific coast, is about 1,200 statute miles, and to the Nicaragua canal about 800 miles. All commerce from these more southern routes must pass directly by the Pacific terminus of the Tehuantepec railroad in going to San Francisco, Oregon, Yokohama, or Hongkong. On the Atlantic side Tehuantepec has similar advantages in distance over southern routes. The calculation shows that on eighteen routes to be affected by opening up Tehuantepec the aggregate saving in distance over the present cape routes and Panama is over 125,000 miles and by sail routes nearly 200,000 miles.

Mr Thomas J. Vivian, an expert statistician of the Census Office, was engaged to make a report upon the probable traffic on the proposed ship railway. The results of his very careful and extended investigation and his clear analysis and grouping of a great number of facts fully justified his selection. The detailed estimates show that in 1896 we might expect a traffic of 5,288,000 tons of freight, if the railroad were fully equipped and sufficient time had elapsed to develop the new commerce. At a rate of $2 per ton, to include handling and transporting from ship to ship, and adding to the total receipts from freight the passenger receipts, we will have a gross income of $10,576,000. Estimating the operating expenses at 60 per cent of the gross receipts, which for through traffic is sufficient, we shall have a net income of $4,294,000. The estimates of traffic for a ship railway, in the same conservative manner, give a total traffic for 1896 of 7,263,000 tons, which at $2 per ton would yield a gross income of $14,526,000. Assuming the cost per ton for transporting from ocean to ocean, including all expenses, at 50 cents, the net income would be $11,044,000.

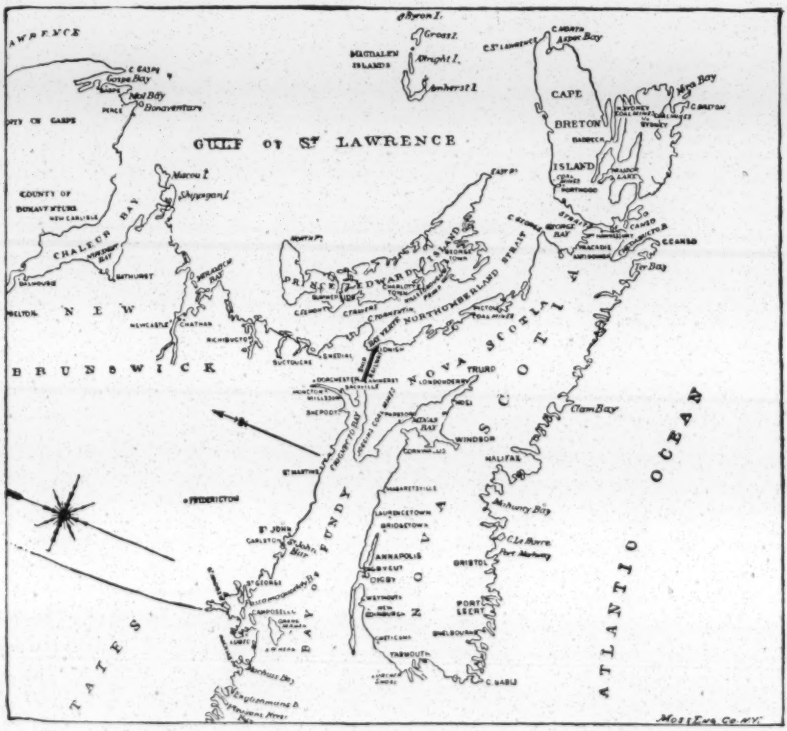
The cost of moving steamships through any canal on the

American isthmus will amount to more than the cost of operating the ship railway. The time in transit through the restricted channels and locks at Nicaragua will be twice as great as the time required on the ship railway, and will even exceed the time required on the railroad to load on the cars, haul across the isthmus, and reload into vessels. The Suez canal, immeasurably easier to maintain than any canal would be at either Panama or Nicaragua, cost for maintenance and working in 1883 $2,784,869. A careful study of the cost of operating the ship railway gives a safe estimate of 30 cents per ton. I have no doubt that with a traffic of 7,000,000 tons this is ample, but I have decided to use 50 cents per ton in the present estimate. As to the cost of preparing the three routes under comparison for a large traffic, the ship railway, fully equipped for carrying vessels weighing 10,000 tons and 7,000,000 tons of freight, will cost on a cash basis about $60,000,000. I shall not estimate the cost of building a ship canal at Panama or Nicaragua. The former, partly completed—certainly not over one-half—has already cost probably $250,000,000 in cash and the plan changed from a sea-level canal to a lock canal, the practicability of which is extremely doubtful, due to inadequate water supply in the dry season; and as to Nicaragua, we must rely upon the report, soon to be made public, of the able board of engineers appointed by the President.

The presentation of the subject will not be complete without a résumé of the proposed method of carrying ships overland by railway, for we are accustomed to regard any method that has not the sanction of use as visionary.

Many projects for commercial ship railways have been made during the last thirty years. In 1872 Brunlees and Webb, of Great Britain, made plans for a ship railway across the American isthmus at Honduras, which would have been built but for the financial depression that soon followed. It was intended to transport vessels of 1,200 tons register. The United States engineers have designed a steamboat railway to avoid the dangerous navigation of The Dalles of the Columbia river. The project and plans have received the approval of Congress and an appropriation of $100,000 has been made to begin work. The ship railway of Nova Scotia, designed by Mr H. G. C. Ketchum, Sir John Fowler, and Sir Benjamin Baker, to connect the gulf of St. Lawrence with the bay of Fundy, deserves special attention, as it is nearly completed. Of the $5,500,000 required, all but $1,500,000 has been expended. The line is about 17 miles long, and hy-

draulic lifts are used for raising the vessels. The platform on which the car and vessel rest is about 40 feet wide. There are 20 hydraulic presses, each 25 inches in diameter, with a stroke of 40 feet, and the system is capable of lifting a vessel carrying 1,000 tons of cargo. There are two tracks of standard gauge, 18-foot centers, with rails weighing 110 pounds per linear yard. This ship railway would now be in operation but for the lapse



MAP SHOWING THE LOCATION OF THE CHIGNECTO SHIP RAILWAY, TO CONNECT THE GULF OF ST. LAWRENCE AND THE BAY OF FUNDY.

of the government charter during a temporary failure of funds for construction. It is confidently expected that a renewal of the charter and an extension of time will soon be granted. The hopes of all advocates of ship-railway methods are centered in this comparatively small railway at Chignecto.

The main features of the ship railway designed for the Tehuantepec isthmus are terminal docks provided with a great lifting steel pontoon, which was sunken with the ship carriage to the

bottom of a dock, guided in its movements by a large number of vertical cylinders. The ship is then floated in over the carriage and placed in exact position, the pontoon is pumped out, and the continuous keel block comes in contact with the keel of the vessel, when a system of hydraulic rams working through the deck of the caisson pushes the keel block closely against the keel and also a large number of bilge blocks and side supports against the side of the vessel. Each one moving up vertically comes in contact with the ship, when the adjustable surfaces of each support, which is faced with rubber, take the form of the vessel by means of a universal hinged joint. The weight of the vessel is thus uniformily distributed, according to the principle on which the hydrauliic system was designed.

The locomotives are then coupled on and the vessel hauled to the opposite terminal, where it is set afloat by exactly the reverse process. At two points on the isthmus it becomes necessary, in order to obtain grades of not more than 1 per cent and to secure a practically straight line, to arrange for an abrupt change of direction, which is done by a great floating turntable, simply a hollow pontoon grounded on the bottom of a masonry basin when the car is hauled upon it, and then raised slightly upon its bearings by pumping water into the basin and made to revolve around a vertical central axis or guide until it takes the new direction.

There is an important advantage which the ship railways have over the ship canals in the American isthmus, particularly in such rainy portions of it as Panama and Nicaragua, the rainfall at the latter place ranging from 200 inches to 300 inches per annum. The advantage lies in the fact that a ship railway is always above the floods, while the canal is always below them and menaced at all times by most serious dangers.

The Nicaragua route has been considered the American route. If it is so, then the Tehuantepec route is still more American in reference to all commercial features, and certainly is of more importance to us from a strategic point of view than any route out of the Caribbean.

The clear and decided views of Admiral Shufeldt upon its advantages were expressed as follows:

"Each isthmus rises into importance as it lies nearer the center of American political and commercial influence, and the intrinsic value of this eminently national work ought to be based upon the inverse ratio of the distance from that center. A canal through the isthmus of Tehuan-

tepec is an extension of the Mississippi river to the Pacific ocean. It converts the gulf of Mexico into an American lake. In time of war it closes that gulf to all enemies. It is the only route which our Government can control. So to speak, it renders our own territory circumnavigable. It brings New Orleans 1,400 nautical miles nearer to San Francisco than a canal via Darien."

The Tehuantepec route can be made more easily accessible to the United States and Mexico by railroad, over which armies and munitions of war can be quickly transported. The gulf of Mexico is clear of foreign complications, belongs to these two great republics of the New World, and when Cuba shall have become a State of the Union, as it may in the near future, we shall hold the entire circuit of this great sea. If, on the other hand, you look upon any English map of the Caribbean sea you will notice that this great power holds every entrance to it. Belonging to Great Britain there are about twenty-five different countries and islands, from British Guiana on the east to British Honduras on the west, which lying directly in front of Panama and Nicaragua guard all approach to them. This important fact is not sufficiently appreciated in our plans for making the Nicaragua canal a United States canal, to be controlled, fortified, and defended by our comparatively small navy against the preponderating naval powers of Europe.

President Diaz is so fully convinced of the superior advantages of even an ordinary railroad at Tehuantepec over any other route located at more southerly points that, in the face of the constant menace of the Nicaragua project, he has gone forward, in spite of stringent financial conditions in Mexico, to complete the National Railroad of Tehuantepec, and now that it is completed to provide adequate harbor terminal facilities and equipment for a large interoceanic traffic. He looks upon the consummation of this great commercial undertaking as one of the most beneficent works of his long and glorious administration.

[NOTE.—The foregoing article is an abstract of a lecture delivered before the National Geographic Society, November 22, 1895. The lecture was considered so important a contribution to the literature of interoceanic communication that it has been printed in full as a public document by order of the Senate. See Senate Document No. 34, 54th Congress, 1st Session.]

THE PRESENT STATE OF THE NICARAGUA CANAL

By General A. W. Greely,

Chief Signal Officer, United States Army

The economic, physical, political, and strategic advantages of the Nicaragua canal have been so fully dwelt upon that their presentation here is not called for, especially in view of the forthcoming report to Congress of the National Commission on this interoceanic waterway. This article is viewed as supplementary to the articles on the Panama Canal Route and the Tehuantepec Ship Railway, in order that the readers of The National Geographic Magazine may know the amount of work done on the Nicaragua canal to date, its possible cost as given by the corporation engineers, and also as estimated by the National Commission, which latter forecast by the press is subject to correction. The following summary covers the main features of the work.

The concession for the canal was granted by Nicaragua to the Maritime Canal Company of Nicaragua, incorporated under act of Congress February 20, 1889, which company reports annually to the Secretary of the Interior. Statements relative to work done are drawn from its report of December 3, 1892. This corporation contracted with the Nicaragua Construction Company for the construction of the canal. In the spring of 1889 detailed surveys of canal, locks, harbors, etc., were completed, the final location of the route was practically determined, and, after preliminary operations, the work of actual construction began October 9, 1889. To restore Greytown harbor a breakwater extending 1,000 feet into the ocean was built and filled in with brush mattresses, rock, and hydraulic-cement concrete. A channel of 10 feet formed naturally, which was increased by dredging to 15 feet, and thus maintained until the accretions to the beach on the windward side of the jetty reached its outward extremity, when the sand passed to leeward and partially closed the new entrance. Five groups of permanent buildings were erected near San Juan, including offices, hospitals, storehouses, etc., which covered an area of 1¾ acres. In addition, freight wharves, machine shops, etc., were built, and the more impor-

tant establishments were connected by tramway. A clearing 468 feet wide was made through the dense forest growth from Greytown inland a distance of 10 miles, and a similar clearing of 9 miles was made to the west of Lake Nicaragua. A telegraph line of 60 miles extended inland to Castillo, and this system was supplemented by telephonic side service. A harbor wharf 260 feet long was built and equipped with modern steam conveniences for handling freight. A railway was constructed from Greytown a distance of 12 miles, with sidings, and was equipped with four locomotives, fifty cars, and suitable modern apparatus for railway and canal construction. The road built is of the most difficult character, as it traverses for 6 miles a swamp considered impassable, where a large amount of corduroy and fill-work was required. The railway line was surveyed to Ochoa and its location determined, as well as from Lake Nicaragua to the Pacific.

The contractors secured for their work the plant of the American Dredging Company, formerly used at Panama, consisting of seven powerful dredges, two tugs, twenty lighters, pumps, etc. Dredging commenced west of Greytown harbor in 1890, and there was opened to a point well inland—1½ miles—a channel 17 feet deep and from 150 to 230 feet wide. The Machuca rapids, San Juan river, were materially improved for steamboat navigation. In addition to this, exhaustive surveys and borings were made in connection with the Ochoa dam, La Flor dam, and other important points on the route. The superior employés were American, while the unskilled labor was performed by natives of Central America and by Jamaica negroes. The health of the employés has been unusually good, the total deaths in three years giving a rate of 1.48 per cent of cases treated.

On November 9, 1890, the Nicaraguan government officially declared that the company had complied with the article requiring an expenditure of $2,000,000 during the first year of work, thus confirming for a term of ten years the company's concessionary rights. The financial troubles of 1893 first compelled the Nicaragua Canal Construction Company, under contract to build the canal, to limit its expenditures to the preservation of its plant, and finally to suspend all payments, which resulted in a receiver being appointed by a United States court in August, 1893. The reconstruction of the contracting company has been accomplished, under the name of the Nicaragua Company, and it is now making preparations for resuming work on the canal.

Meanwhile the United States Senate, in connection with bills

for aiding the construction of this canal, has carefully considered the whole subject, including the operations of the corporations mentioned above. Three favorable reports have been made—two by Mr Sherman, No. 1944, Fifty-first Congress, Second Session, and No. 1142, Fifty-first Congress, Second Session. The last, by Mr Morgan, No. 331, Fifty-second Congress, Second Session, on April 14, 1894, adopts and reprints the first two reports. It appears that the Maritime Canal Company expended between October 5, 1889, and October 7, 1890, $3,099,971, and that the total expenditures of the construction company aggregate $4,451,568.

The total length of the canal is to be 169.45 miles, of which 26.78 miles will be excavated canal and 142.67 free navigation, and there will be three locks on each side of Lake Nicaragua. The cost of the canal, equipped for full service and extending to deep water in both oceans through completed harbors, was estimated by Chief Engineer A. G. Menocal at $65,084,176, including 25 per cent for contingencies. These estimates were increased by a revisionary board of five distinguished engineers—J. Bogart, E. T. D. Myers, A. M. Wellington, H. A. Hitchcock, and C. T. Harvey—to $73,166,308, which amount other special contingencies augmented to $87,799,570; interest charges would raise the grand total to $100,000,000. The Senate committee states, however, that all work done has fallen within Mr Menocal's estimates. The reports dwell upon the value of this interoceanic waterway to the United States, strategically, politically, and also economically. The committee placed the outside limit of the cost of the Nicaragua canal at $100,000,000, and it therefore recommended that the United States guarantee $70,000,000 of 3 per cent bonds, which would vest the United States with the ownership of 70 per cent of the entire capital stock.

The final outcome of this report was the authorization by Congress of the appointment of a commission of engineers to examine and report upon the route and surveys of the Nicaragua canal.

This commission, consisting of Col. W. P. Ludlow, U. S. Army; M. T. Endicott, U. S. Navy, and Alfred Noble, in the summer of 1895 examined the route and such of the work as had been done, and submitted its report to the President, by whom it will be transmitted to the present Congress. The character and substance of the report have not been officially made public.

The New York *Herald* of November 25, 1895, put forth detailed accounts of the report, which lack official confirmation. The salient features of this article set forth that the commission

has increased the canal company's estimate of $69,893,660 to a "provisional" estimate of $133,472,893. Authoritative estimates can be obtained only at the cost of $250,000 for an exhaustive survey covering two dry seasons. The present location from Greytown to Brito is practically condemned, and it is suggested that the entrance to Greytown harbor should be moved eastward and its depth increased to 6 fathoms; that the Brito harbor should be moved southeastward and its breakwater extended considerably, and that the canal should be moved south of Bernard lagoon and be straightened, etc. The proposed rock-filled dam at Ochoa, across a powerful river and on a sand foundation, presents grave difficulties, and should be built only after careful study; it should preferably be replaced by a masonry structure. The physical conditions and regimen of San Juan river and Lake Nicaragua should be carefully studied; the proposed channel excavated to widths varying from 250 to 400 feet instead of from 125 to 150 feet; all locks should be widened to 80 feet, so as to permit the passage of war vessels; rainfall observations should be instituted over the whole route; all streams be gauged, and full explorations of alternative routes be made in the eastern division.

These recommendations of the commission for a deeper and wider channel, for the construction of passing points, a reduction in lock-lift, more capacious and deeper harbors, and a more stable construction, are in the direction of desirable improvements, which, however, practically double the cost of the canal.

Even should these enhanced estimates be correct, and should the conservative judgment of the commission be fully indorsed by other engineers, it remains to be seen whether a few millions of dollars, more or less, shall stand in the way of securing an interoceanic communication which the Senate committee has said "is indispensable to our physical and political geography and to the proper care of the Government for the protection and prosperity of our Pacific coasts."

In view of the national interest taken in this question, and especially at this juncture, it would seem that no backward step should be taken that would tend to weaken the power and influence of the United States as the dominating factor in the welfare of the American continents. From an American standpoint this canal seems to be a necessity, not only for our own commercial interests and national protection, but also as part of our "public policy of uniting the republics of America by works of peaceful development."

EXPLORATIONS BY THE BUREAU OF AMERICAN ETHNOLOGY IN 1895

By W J McGee

The most extended exploratory work of the year was that of an expedition in charge of the writer through the territory occupied by the Papago Indians in Arizona and Sonora, and by the Seri Indians in western Sonora and on Tiburon and Alcatraz islands, in the gulf of California. During 1894 an expedition was carried through Papagueria and into the borderland of the Seri country for the purpose of making collections among the Indians of both tribes, and the object of the expedition of 1895 was to obtain supplemental information concerning the social organization of the Papago Indians, but especially to explore the territory of the Seri and to make studies of and collections representing the maritime habits of these Indians. The party outfitted in Tucson early in November, crossed the frontier at Sasabe, and spent three weeks in visiting the villages of Papagueria and in surveying extensive prehistoric works left by a people of somewhat advanced culture, probably the ancestors of the modern Papago. Mr Willard D. Johnson, who formed one of the party, carried forward a planetable survey, which will yield the first trustworthy map of the region. Entering the Seri territory early in December, the party explored the area lying west of Bacuachi river and the delta of Sonora river, making a station on the highest point (about 5,000 feet) in the range provisionally designated the Seri mountains, and afterward embarked in a small boat in that portion of the gulf of California commonly mapped as Kino bay, coasted to the strait El Infiernillo, and crossed over to and explored and surveyed Tiburon island. The country of the Seri Indians was found to be clearly set apart by natural features from the body of Sonora. Tiburon island is separated by a turbulent strait from the mainland, while the mountainous mainland area contiguous to the strait is still more effectively barred from interior Sonora by a broad desert zone of saline playas and sand dunes something like the Mojave desert of California; indeed, some of the observations indicate that this zone

lies below sea level, and that it was during recent geologic times cut off from the gulf by the delta of Sonora river and afterward desiccated by evaporation. The territory bounded by this desert barrier is mountainous, yet exceedingly arid; it is two or three thousand square miles in area, including about five hundred square miles comprised in Tiburon island. The territory is claimed and exclusively held by the Seri Indians, a distinct aboriginal stock, who have been at war with all other peoples almost constantly from time immemorial and are now reduced to some 400 in number. These Indians are of especial interest from their isolation, from a more warlike disposition and a more primitive culture than appear among other known people of North America, and from a variety of features connected with these characteristics. They are of splendid physique, with notably dark skin; they live chiefly on the flesh of turtles and other marine organisms, partly on game and wild fruits, most of their food being eaten raw; they are without agriculture, and have no domestic animals save a few dogs; their habitations are flimsy lodges of shrubbery and turtle shells; they are scantily clothed, chiefly in pelican skins; they navigate their waters by means of the balsa, manufacture simple baskets and a distinctive pottery, and make efficient use of excellent bows and arrows, yet their stone art is below the stage commonly called paleolithic; and they have a singular marriage custom tending to perpetuate their isolation. No prehistoric works, save such as they now produce, are found in their territory. While the Indians fled at the approach of the party, considerable collections were made in the rancherias they had just deserted, the articles designed for barter with them being left in exchange. In addition to the ethnologic researches and mapping, somewhat careful studies were made of the flora, fauna, and geologic development of the entire area traversed by the expedition. The exploration of the Seri country, hitherto unknown except as to the coast, was attended with some risk and hardship, due chiefly to dearth of water, but was without casualty.

In December, 1894, Mr James Mooney began a special study of the Kiowa Indians in Oklahoma. He recently returned from the field, after nearly ten months of successful work. The Kiowa Indians possess a highly interesting calendar system of strictly aboriginal character, and this system was one of the subjects of Mr Mooney's researches. Leading personages of the tribe keep a sort of year book in which the principal events of the seasons

are recorded in rude conventional symbols, the years being indicated by conspicuous symbols for the winter season, in consequence of which the records are sometimes denominated "winter counts." Mr Mooney was able to collect a considerable number of these calendars, which are of special interest as records of the history and migrations of the tribe during the last half century. From the records and from accompanying verbal statements, carefully checked by comparing different accounts, it is learned that this tribe of the plains is among the widest wanderers of their race. Although their original habitat was in the middle plains, they were accustomed to send parties on trading and marauding expeditions eastward into the trans-Mississippi forests, westward into and beyond the Rocky mountains, northward to the Saskatchewan, and southward over the deserts of northern Mexico as far as Durango, and even across the Sierra Madre to the vicinity of the Pacific, near Mazatlan. These records of the Kiowa calendars explain the wide distribution of primitive art products over the United States and corroborate the evidence of widely scattered obsidjan, copper, sea shells, etc., as to the extent of aboriginal commerce.

A notable expedition of the season was that of Dr J. Walter Fewkes, who explored the little-known canyons of the Mogollon escarpment in central Arizona and afterward made extensive collections of prehistoric pottery near Keams canyon. While on the headwaters of the Rio Verde, along the face of the great escarpment, he was so fortunate as to discover extensive ruins of cliff-houses, some of which showed no evidence of exploration, and from these considerable collections of interesting archeologic material were made. His principal results were obtained at the prehistoric pueblo of Sikyatki, near Keams canyon. Here, in company with Mr F. W. Hodge, he excavated a ruin known from tradition, as well as from the collection of objects discovered, to be prehistoric. A large quantity of finely decorated pottery with associated objects was obtained. The pottery includes many examples of the finest grade of aboriginal work in texture, finish, and decoration. The collection, which comprises nearly 700 earthenware utensils, beside numerous objects of wood, stone, bone, etc., has been brought to Washington and is now in the National Museum. Competent judges are of opinion that it is the finest single collection of prehistoric pottery thus far made on the Western Hemisphere.

After leaving Sikyatki Mr Hodge made a tour of the pueblos

of New Mexico, beginning at Zuñi, then visiting Laguna and Acoma, and in turn the villages scattered along the upper Rio Grande and tributary valleys from Isleta to Taos. The primary object of this reconnoissance was the identification of the names of certain "provinces," tribes, and pueblos mentioned by Spanish explorers in the sixteenth and seventeenth centuries and the collection of data relating to the ethnology, and especially to the kinship systems, of the Pueblos, of which comparatively little has hitherto been known. In these investigations Mr Hodge was very successful, for except among the Tiwa he was enabled to obtain complete records of all the clans, both existing and extinct, and from all the tribes (including the Pecos, of whom there are but two survivors) much valuable data which will contribute to the identification of tribal and village names of Spanish record, as well as bearing on their cosmogony, migrations, etc. He also succeeded in locating on the Rio Grande the village whence the Hano people of Tusayan migrated nearly two centuries ago; in determining quite clearly that the pueblos of Kawaika and Paiyupki at Tusayan were abandoned during the historic period, the inhabitants moving to Laguna and Sandia respectively, and that descent among the Tewa people, at least in Nambé, Santa Clara, and Tesuque, is agnatic, while among all other pueblos descent is invariably in the line of the mother. These and many other problems which in the past have puzzled ethnologists not a little Mr Hodge has at last been able to solve.

GEOGRAPHIC LITERATURE

The Yellowstone National Park: Historical and descriptive. Illustrated with maps, views, and portraits. By Hiram Martin Chittenden, Captain, Corps of Engineers, U. S. A. Pp. 397. Cincinnati: The Robert Clarke Company. 1895. $1.50 net.

This book comprises three parts, "Historical," "Description," and "The Future." The first contains an excellent summary of the early trappers' tales regarding this region, showing, as is well known, that they were not unacquainted with its marvels. It recounts the Washburn and Hayden expeditions, the legislation establishing the National Park, and the numerous army expeditions which for exploration or pleasure have traversed it. It summarizes also the administration of the park. The second part describes rather inadequately the topography, geology, fauna and flora of the region, and then, in the ordinary guide-book form, describes "a tour of the park." The third part, which is very brief, only

18 pages in length, is devoted mainly to re-stating the well-known arguments against permitting the entrance of railroads. The book closes with a series of appendices comprising a list of geographic names, with their origin, the legislation affecting the park and rules for its administration, a statement of appropriations for its maintenance, a list of its superintendents, and a bibliography. It is difficult to place this book. It ranks far above the ordinary guide-book, yet as a history its value is lessened by the military bias of the writer, and as a geographic work, descriptive of this interesting region, it may be characterized by the statement that only 14 pages are devoted to its geography and geology, 13 to geysers and hot springs, and 11 to the native life of the region. The book is profusely illustrated with beautiful cuts, and contains several maps, but the latter are not in keeping with the typography and with the other illustrations.

Sixteenth Annual Report of the United States Geological Survey. Part III: Mineral Resources of the United States, 1894, Metallic products. Pp. 646. Washington, 1895.

It is not easy to recognize in the handsome royal octavo volume before us the mineral report of the Geological Survey, which has hitherto appeared in so much less attractive a form. Although Dr Day's reports no longer constitute a series by themselves, they cannot be said to have lost even in individuality, for the new volume is so profusely illustrated with maps and diagrams and is in almost every other respect so distinctly superior to its predecessors as not only to add greatly to its practical value, but to place it in the very front rank of those admirable publications with which the United States government enriches from time to time the scientific literature of the world. The report contains statistics of the production of the various metallic minerals (those of the non-metallic are to follow in a separate volume) in the different states of the Union; but it does more than this. It presents like statistics (in many cases extending over a long series of years) for other countries, together with tables of exports and imports. In addition to these statistical compilations it contains several hundred pages of interesting and instructive text on the geographic distribution of the mineral resources of the world, in the preparation of which several eminent experts have been specially employed. The volume is, in short, a veritable mine of valuable information concerning some of the most important branches of human industry.

Terrestrial Magnetism: An International Quarterly Journal. Published under the Auspices of the Ryerson Physical Laboratory, A. A. Michelson, Director. Chicago, University Press. Vol. I, No. I, January, 1896. Edited by L. A. Bauer, with the Coöperation of a large Number of American and Foreign Associates.

The compass is a very old invention, the discovery of its north and south pointing property having been made by the Chinese centuries ago It is more than four centuries since it received a fixed place in navigation under the name Mariner's Compass. That it does not point truly north and south but departs or declines from the meridian was known in Columbus' day. At that time it was supposed that the departure from true north, or declination of the needle, was constant for any one place, though

not the same in all places. That it is not always the same at any one place is said to have been discovered by Columbus; so that the variation of the variation is a discovery four centuries old. That the needle, if free to move in any direction, would not "hang level," but that one end would decline or dip below the horizon, is also an old discovery, having been discovered by Georg Hartmann in 1544; and, lastly, that the force that acts upon the needle to make it point north and south is not the same in all places has been long known.

The true cause of the behavior of a compass needle has been a field for speculation and study ever since its peculiar behavior was observed, and a few students had up to the time of Gauss proposed and laboriously worked out ingenious theories to explain the phenomena observed. The publication of Gauss' great work in 1838, however, marked a great advance and gave a new and powerful impulse to the subject. The Magnetic Union, formed in the third decade of the present century, chiefly owing to the researches of Gauss, caused the establishment in various parts of the world of magnetic observatories, founded and maintained by various governments. Of those so founded in the forties, several have maintained a series of almost uninterrupted observations to this day. This period of 60 years has seen progress in our knowledge of terrestrial magnetism, but without any epoch-marking event. A vast number of observations have been accumulated, the 24 constants in Gauss' fundamental formula have been more accurately determined, and a number of minor phenomena observed and explained, but the subject is far from being exhausted. The modern applications of electricity to practical affairs is not without its effect upon the subject of terrestrial magnetism.

Is not the journal before us, then, to mark a new epoch in our knowledge of this subject? It seems strange that, when almost every other branch of science has long had its special journal or organ, we should have waited almost for the dawn of the twentieth century for the first number of the first journal devoted to a matter of such great practical moment and for four centuries known by all civilized men to be important.

We welcome this journal, then, as a needed one, rightly conceived and giving promise of usefulness. It enters, and enters under favorable auspices, a field not hitherto occupied by any scientific journal. The names of the editors, the laboratory, and university from which it comes all combine to promise excellent results. It will be strange indeed if distinct gains in human knowledge do not result from this enterprise.

The editor, Dr Bauer, though a young man, is a most enthusiastic student in his chosen field. After several years of service in the United States Coast and Geodetic Survey, devoted chiefly to magnetic computation, he went to Europe and devoted his energies to magnetic studies. His doctor's degree was obtained last year, as the outcome of these studies. To him more than to any other belongs the credit of founding the first journal given wholly to the subject of terrestrial magnetism, and patriotic Americans will perhaps derive some satisfaction from the fact that the journal was founded in the United States.

To the editor and his associates and to the University of Chicago we tender our congratulations and hope for them a large measure of success.

YUCATAN IN 1895

The following is taken from a valuable report recently received at the Department of State from Mr R. L. Oliver, United States consul at Merida:

The government census is approaching completion, and from data already received it is apparent that the total population of the state approximates 500,000, of whom 60,000 are in Merida.

Yucatan has always been considered among the most advanced states of Mexico in point of education. Schools have attained a high order since the advent of independence. While under the control and supervision of the local governments, the system of matriculation and education is mapped out by the federal and state authorities through their respective boards of education. The law is compulsory, and though it is not strictly enforced in Yucatan, reports show a good attendance.

Sectarian schools are in decadence—in fact, they are only primary schools for the young. The revenue for their support is derived from donations by patrons. The non-sectarian or public schools are maintained at the expense of the state. The governor appoints directors, who in turn select professors and teachers. The total expenditure for public instruction for the scholastic year 1894–'95 has been about $100,000 (gold); this sustained 435 schools.

Manufactures are confined to articles for local wants, such as soap, matches, candles, shoes, rope, etc.

There are four railways, owned and operated exclusively by natives. One broad-gauge road has 75 miles in operation; the others, narrow-gauge average about 60 miles each, completed, but are in course of extension. Tariffs for passengers and freight are about one-half the rates charged for local business in the United States.

Except wheat, rye, and other small grains, almost any plant will thrive, but the principal products are corn, beans, sugar, and hemp. The last named is a phenomenally hardy plant and flourishes almost equally well with or without rain; corn, beans, and sugar require irrigation and yield barely sufficient for home requirements. If there is a failure, as at present in corn, the deficiency is supplied from Mexico or the United States. The interior being unable to make up the deficiency in corn, the legislative authorities of Yucatan petitioned the federal government to reduce the import duties on foreign corn that this necessary article might be within the limit of moderate price. The government scaled the tariff 50 per cent, pending the next harvest, and several cargoes have been imported from the United States.

The people are very industrious. Necessity would impel them to be so were they otherwise, for although Yucatan is not an over-populated country the industries are so concentrated, so lacking in diversity, and so monopolized that the less fortunate are continually at a disadvantage and must necessarily be on the alert to share in the inadequate distribution. This applies also to the professions.

Laborers in the cities average eight hours' work, are paid by the piece

in industrial pursuits, and earn about 50 cents (gold) per day. Railway and skilled laborers earn from 75 cents to $1 per day. They wear the same clothing, chiefly cotton and linen, during the entire year; sandals of the ancient Egyptian pattern are worn instead of shoes. Trade unions do not exist and coöperative action is infrequent, except in cases of foreign intervention, concerning which they are extremely sensitive.

On the plantations, where it is necessary to be exposed to excessive tropical heat under the direct rays of the sun, no laborers have withstood it as have the native Indians. In past times unsuccessful colonies were formed by Europeans; later, Chinese were contracted for to work on the hemp plantations. They were not altogether satisfactory, as they are physically unable to complete the daily task allotted to the native laborers—that is, to cut a certain number of leaves of hemp (sisal) for a stipulated price. The daily task is two or three thousand leaves, at the rate of 16 cents (gold) per thousand. On this largely depends the pecuniary success of the planter; not that his margin of profit is so limited in what it actually costs to produce this fiber, but there is the enormous outlay for the preparation of the lands and for the planting; the necessary delay of four or five years before the plant is large enough to cut; the instability of the market, which is ever fluctuating; the onerous export duties, state and federal; the large personnel of the plantations—mechanics, overseers, and servants—who, independent of their wages, are advanced provisions and clothing and furnished medicine and medical attendance by the proprietor. There is now a great scarcity of laborers, and with the new applications of the sisal fiber and its consequent increasing demand it is becoming a serious question how to meet prospective emergencies.

A project is on foot to subdue and domesticate the Maya Indians, variously estimated at from 10,000 to 20,000 in number, who have from time immemorial held invincible sway over the southeastern part of Yucatan. It is hoped to augment from them the number of farm hands; but even in the event of accomplishing the subjugation of this semibarbarous race, it is exceedingly doubtful if the present generation can be utilized, so refractory are they to civilized pursuits and so indolent and thriftless. Their trading-posts are on the boundary lines of British Honduras. At times their chiefs visit Belize to purchase cloth, replenish their ammunition, and renew their contracts with the timber merchants, who pay them so much per ton for the privilege of cutting wood in their territory. They are friendly with the British and never interfere with negro cutters sent from Belize, but a Mexican or a native of Yucatan dares not encroach upon their lands. As this part of Yucatan is more healthful and its soil better adapted to the cultivation of fruits, sugar cane, and grains, it is not improbable that after the pacification of the Mayas the government will offer inducements to foreigners seeking homes in the tropics. The geographical and the topographical situation of this part of the peninsula would indicate that it is essentially a horticultural district. Down by the Caribbean sea it is easily accessible to shipping, and its products would find a market. It lies in the path of vessels that now ply between the southern ports of the United States and ports of British and Spanish Honduras. This would also be the route for vessels to and from Nicaragua in

the event of the building of the canal. Another advantage of transcendant importance is that of Ascension bay, which is one of the largest and deepest harbors in all Mexico, and with the exception of Acapulco, on the Pacific, affords a safer anchorage than any other. This is a desideratum of no little magnitude when it is known that most of the Mexican gulf ports are open roadsteads and that in the winter months, when northers are frequent, shipping is hazardous and uncertain.

Up to 1891–'92 the credit of Yucatan in Europe was unlimited and her merchants enjoyed an enviable reputation for integrity, but they were overtaken by the financial crisis, which found them overstocked and deeply indebted. Collateral securities shrank, debts contracted in gold had to be met with its equivalent in silver, which had coincidently depreciated in its paying value 50 per cent; money became stringent and finally the collapse came. Many large dealers in dry goods and miscellaneous articles were forced to suspend. They represent to European creditors millions which are hopelessly lost. This unfortunate state of affairs is largely due to the long credit system. However, this salutary lesson has had the effect of restricting them to more business-like methods. The tide of trade will eventually turn to the United States, this market affording quicker transportation facilities.

The chief articles of import embrace groceries, canned goods, etc.; dry goods, notions, cashmeres, men's furnishings, millinery, and hardware of all descriptions, except plows, hoes, etc., which are not used.

Hennequen (sisal) is the chief export. The annual output is nearly 400,000 bales of 400 pounds each. In the first quarter of the present year there were shipped 81,030 bales, valued at $582,932.50, United States currency, on which state and federal duties amounting to $132,481 ($71,612 United States currency) were paid; over 12 per cent ad valorem. Of the 81,030 bales shipped, 66,269 were destined for the United States. With the exception of a small fraction, they were transported in other than American vessels. The August, 1895, imports amounted to 6,568 tons; 2,133 tons were imported in American vessels; 4,435 tons in English, Norwegian, and German vessels. The exports amounted to 6,600 tons, of which 560 tons were exported in American vessels and 6,040 tons in English, Norwegian, and German vessels.

From January to June, 1895, there were shipped to interior points of Mexico 3,070 tons of coarse, unrefined salt. The high tariff on foreign salt makes it an expensive article. The home mines are difficult to work, and as in most cases they are only surface deposits of the sea the yield depends greatly upon the weather.

The exports of logwood for the first three months of 1895 show 2,634 tons, valued at $80,000 in United States currency, cleared for European countries. Other articles of export in small quantities are hides, hammocks, sarsaparilla, etc. The total declared exports to the United States for the fiscal year ending June 30, 1895, were: From Progreso, $2,062,909; from Merida, $897,702; total, $2,960,611 in United States currency.

Value of imports during the fiscal year 1894–'95, $1,092,981; value of exports, $8,376,680. Total amount of federal duties paid thereon, $1,155,932.

PROCEEDINGS OF THE NATIONAL GEOGRAPHIC SOCIETY, SESSION 1895–'96

Regular Meeting, December 27, 1895.—President Hubbard in the chair. Amendments to the by-laws were adopted as follows:

ARTICLE IV—*Officers.*—The business of the Society shall be transacted by a Board of Managers composed of eighteen members, six of whom shall be elected by the Society at each annual meeting. They shall serve for three years, or until their successors are elected. A majority vote shall be requisite for election. Vacancies arising in the Board shall be filled by the Board.

The Board of Managers shall elect annually from their number a President, six Vice-Presidents, a Treasurer, a Recording Secretary, and a Corresponding Secretary.

The following resolution also was adopted:

Whereas the Society has adopted certain amendments to its by-laws, by which it is provided that the members of the Board of Managers be elected hereafter for terms of three years, and one-third of its members retire each year: therefore,

Resolved, That the Board of Managers is hereby instructed to group its members in three classes, the first of which shall retire in May, 1896, the second in May, 1897, and the third in May, 1898.

Vice-President Ogden delivered an address on Coast Hydrography and its Uses, and Mr G. W. Littlehales read a paper entitled, "Why the Sea is Salt."

Special Meeting, January 3, 1896.—President Hubbard in the chair. Dr D. C. Gilman, President of Johns Hopkins University, gave an address on The Geographic Development of Universities.

Regular Meeting, January 10, 1896.—President Hubbard in the chair. Mr William Eleroy Curtis read a paper, with lantern-slide illustrations, on Venezuela: her Government, People, and Boundary.

Special Meeting, January 17, 1896.—President Hubbard in the chair. Mr Robert E. Peary, Civil Engineer, U. S. Navy, delivered an address, with lantern-slide illustrations, entitled, "Explorations in the Far North," relating more particularly to his recent expedition to northern Greenland.

Regular Meeting, January 24, 1896.—Joint Meeting with the American Forestry Association. Hon. J. Sterling Morton, Secretary of Agriculture, in the chair. Addresses on the subject of the Public Forests, Lands, and Waters of the United States were delivered by Hon. Fred. T. Dubois, U. S. S., Hon. John F. Lacey, M. C., Hon. Thomas C. McRae, M. C., and Mr William E. Smythe, of Chicago.

ELECTIONS.—New members have been elected as follows:

December 27.—Hon. Wm. M. Aiken, Chief Engineer G. W. Baird U. S. N., Col. J. W. Barlow, U. S. A., Ensign L. C. Bertolette, U. S. N.

Capt. Nathan Bickford, Lieut. E. B. Chambers, E. R. E. Cowell, Pickering Dodge, D. J. Evans, Capt. M. C. Goodsell, U. S. M. C., H. R. P. Hamilton, Hon. John B. Harlow, Robert S. Hatcher, Mrs Mary B. Jackson, R. M. Johnson, Capt. Louis Kempff, U. S. N., Miss Grace D. Litchfield, Miss Cordelia L. Mayo, A. E. H. Middleton, Hon. Joseph S. Miller, Rev. Dr W. H. Milburn, Maj. Hannibal D. Norton, Maj. G. C. Reid, U. S. M. C., Capt. George C. Remey, U. S. N., George R. Simpson, Hon. O. P. Tucker, Maj. W. M. Waterbury, U. S. A.

January 10.—Señor José Andrade (Venezuelan Minister), Mrs D. C. Chapman, W. V. Cox, John F. Davies, John F. Downing, J. B. Fellheimer, Miss Ellen B. Foster, Capt. S. W. Fountain, U. S. A., Maj. E. A. Garlington, U. S. A., Prof. Edward L. Greene, Lieut. C. H. Harlow, U. S. N., Comdr. J. N. Hemphill, U. S. N., Franklin H. Hough, Dr J. C. Hvoslef, Medical Director Samuel Jackson, U. S. N., Dr P. E. Joslin, Lieut. J. F. Reynolds Landis, U. S. A., W. H. Pennell, Miss Alice C. Pugh, Mrs Nellie Grant Sartoris, Henry A. Seymour, Dr R. M. Thornburgh, Mrs John N. Webb, Alfred Jerome Weston, Hon. Carroll D. Wright.

January 24.—Miss Harriet Bartlett, Dr Frank K. Cameron, Richd. T. Fussell, C. A. Gilman, Dudley W. Gregory, Dr G. T. Howland, Mrs Ida Rome Knapp, Mr E. de Kotzebue (Russian Minister), George A. Lewis, James McCormick, Mrs J. C. McKelden, Hon. Richard Olney, Wilson N. Paxton, Judge M. E. Poole, Gov. A. R. Shepherd, I. C. Slater, James H. Thomas, James A. Watson, John E. Wright.

OBITUARY.—The Society has to deplore the deaths of the following members during the month of January: Mr E. B. Wight, a well known and much respected journalist, representing the Boston *Journal* and the Chicago *Inter-Ocean* at the National Capital, and Mr S. C. Gilman, a promising young civil engineer and explorer, residing at St. Cloud, Minnesota, who, only a few days before his untimely death, contributed a valuable paper on his explorations in the Olympian mountains, Washington, to appear in an early number of this magazine.

GEOGRAPHIC NOTES

NORTH AMERICA

FRANZ JOSEF LAND. The published statements of Mr A. Montefiore, the spokesman of the Jackson-Harmsworth expedition, now enable one to definitely outline the outcome of the expedition down to July last. Jackson left Khabarowa in the *Windward* August 16, 1894, and met the ice-pack in 76° 49′ N., 49° E. Bell island was sighted, 30 miles distant, August 25, but unfavorable ice conditions prevented landing there or at cape Grant, which was in sight six days later, distant 40 miles. A landing was made, September 6, at Bell island, and the ship was frozen in while discharging cargo, September 13. Jackson, with his chosen explorers, passed the

winter very comfortably in a wooden house erected at cape Flora. The ship's crew wintered on the vessel and lost one man, the health of others being unfavorably affected. About sixty polar bears were killed, four being females. An autumnal depot was laid down at cape Barents and a spring one, in March, 1895, by a trip of six days, at Peter head, entrance of Markham sound.

The long journey, in which four ponies were used with great advantage, occupied from April 16 to May 13. Softening sea-floes and signs of open water constrained a return from the farthest north, 81° 20′ N., 54° 53′ E. Payer's map of 1874 is said to be inaccurate and misleading. Zichy, Alexandra, and Oscar lands resolve themselves into groups of islands, and Richthofen peak, of Payer, could not be located.

Mr Montefiore, it is said, declares that Jackson's success in his first year is unprecedented. If such report be correct, this will not be the first capable explorer who may ask protection from injudicious friends who seek to aid him by unfounded aspersions of others. European explorers are able to refute on their own account Montefiore's claim, especially Payer, who, starting from a more southerly point, surpassed Jackson's latitude by 37 miles.

For America, it is indisputable that Hall, in 1870–'71, far exceeded Jackson's latitude and opened up a new route and region, surpassing in importance and extent anything that Jackson has done; this with the loss of one man—himself. Greely in his first year, 1881–'82, explored 4,000 square miles of new land and surpassed the highest latitude, made before or since, without the loss of a man. Peary, in 1891–'92, made the most remarkable inland ice journey on record, crossed Greenland to a point far beyond his predecessors on the east Greenland coast, with the loss of a single man, by accident. Against this is Jackson's northing of some 80 miles, with a loss of three men, one at cape Flora and two on the return voyage of the *Windward*.

Alaska. Congress is to appropriate $75,000 to mark the Alaskan boundary along the 141st meridian of west longitude, on which meridian have been determined three important points—Mount St. Elias, Forty-mile creek, and Porcupine river. By independent surveys, by United States and Canadian engineers, the points established differ only six feet at Mount St. Elias and 400 feet at Porcupine river. Canada desires to establish the meridian astronomically by joint scientific survey, which would require several years. The United States favors, as a less difficult and more speedy plan, a survey based on the points already established.

Mexico. According to the last message of President Diaz, 566 miles of new telegraph lines have been built, the most important uniting Tacotalpa, Chiapas, with Penosique, Tobasco, opening a new route with Guatemala, and making a total mileage of 56,442 miles. Among important railway extensions is that from Monclova to the Pacific, of which 292 miles have been approved. The surveys of the road from Merida to Campeche are progressing and the plans of the lines from Merida to Progreso have been adopted. The drainage works of the valley of Mexico are almost concluded, the excavations have amounted to 53,160,000

cubic feet, and the tunnel is finished for a length of 32,140 feet. The grand drainage canal is nearly 30 miles long.

Surveys have been completed for a cable road to connect the Interoceanic Railway with the summit of Popocatepetl, ascending from the ranch Semacas, on the northwest side. The railway is mainly for the transportation of sulphur from the volcano, but it will be available for tourists. Work has been commenced on a line from Baroteran, on the Mexican International Railroad, to Laredo, Texas, and thence to Mier, Mexico, on the bed of the Gould railroad, graded about ten years ago between these points. The government has modified its tax on minerals, which now amounts to 5 per cent of the value of silver and gold. It is divided into a federal stamp tax of 3 per cent and a coinage tax of 2 per cent. Mexican smelters operating under governmental concessions are not liable for the coinage tax on silver extracted from low-grade lead and copper ores.

CENTRAL AMERICA

NICARAGUA. A telegraph line has been built between Acoyapa and Rama. The work on the railway between Rama and San Ubaldo, 178 miles, began July 28, 1895, and should be completed in two years.

THE Nicaraguan government has extended its monopoly of native distilled spirits to its Atlantic coast districts, except to the free port of San Juan, and imposes corresponding duties on foreign spirits.

SOUTH AMERICA

THE Emperor of Brazil once gave a concession to an Englishman to open the channel connecting the Orinoco with the Amazon, and the latter was to have the exclusive right to navigate the waters for a term of twenty-five years as a reward for his enterprise, but for some reason or another the contract was not carried out.

THE bronze statue of George Washington erected by Guzman Blanco at Caracas is believed to be the only statue of the Father of his Country outside the United States. The inscription upon it states that Washington "Filled one world with his benefits and all worlds with his name," a unique tribute to his greatness that was probably written by Blanco himself.

DURING the visit of Bolivar to the United States he spent a day at Mount Vernon, where, placing his hands reverently upon the coffin of Washington, he made a solemn vow to devote his life to the liberation of his country. Reaching his native land, he became active in the revolutionary propaganda and soon had to seek refuge in Europe. Fifteen years later, however, after a struggle to which that of our revolutionary fathers offered no comparison, he sat in the capital of Bogota, the founder of five republics—Venezuela, Colombia, Ecuador, Peru, and Bolivia—the last having been named in his honor. At that time the states were consolidated under a single government, with Bolivar as president. After having for the fourth time been elected president he was driven from the country and died in exile.

On the upper Orinoco, during the struggle of Venezuela for independence, occurred the only naval battle that was ever fought on horseback. Bolivar, at the head of his army, had been trying to cross for several weeks, but was prevented by several Spanish gunboats that moved up and down the stream as he did. Becoming exasperated, General Paez one night spurred his horse into the stream, followed by three thousand llaneros, or cowboys, whose horses had been taught to swim as well as to gallop. The Spanish fleet was taken entirely unawares. The llaneros clambered from their saddles to the decks of the vessels and let their horses swim back to shore alone. Thus, after cutting off their own retreat, it was a question of win or die, and so desperately did they fight that every vessel was captured.

The Ceiba railroad, in Venezuela, originally 30 miles long, has been extended from Mendoza eastward a distance of 32 miles, to connect with the branch from Valera, 15 miles long. Another line is under construction from Encontrados to La Fria, 62 miles. It is intended to extend the road 25 miles farther to San Cristobal, the commercial center of a great agricultural section. Contracts have been made also for railroad lines from Maracaibo to Perija and from Lake Maracaibo to Carora. The former is to be built within two years and the latter within five.

ASIA

Syria. The first railway was opened August 3, 1895, under French management. It extends from Beirut to Damascus, a distance of 91 miles.

China. M. Berthelot, French Foreign Minister, says that the Franco-Chinese treaty opens to French trade a region containing 100,000,000 inhabitants. Its capital is Chung-king.

Persia. Concessions have been granted to Herr Moral to construct a carriage road from Teheran to Bagdad, and a steam or electric railway from Teheran to villages 10 miles north. A Russian company has been granted a concession to construct a harbor at Enzeli.

Japan. The sum of $13,000,000 has been voted for a double-track railway to be built between Tokyo and Kobé, 376 miles, passing through Yokohama, Kyoto, and Osaka. Previously 29 concessions had been granted, covering 2,193 miles, of which 1,549 miles have been opened. Of state railways, 580 miles have been completed and 398 miles are in course of construction.

India. The efforts of Mr A. F. Mummery and three others, in August, 1895, to explore the Nanga Parbat region of the Himalaya mountains ended in the death of the leader and two Gurkha soldiers. Mummery was turned back, by the illness of a Gurkha, at the height of 20,000 feet on the main peak of Nanga Parbat. Later, Mummery and the two soldiers were lost while exploring a side glacier, being presumably buried under an avalanche.

The Mekong. The French are rapidly developing the region lately ceded by Siam. A telegraph line is to be constructed from Attopeu, the center of the Nam-Kong gold district, and post-offices are also being es-

tablished. Steamers will soon be plying on the Mekong. That river has been found navigable for 1,500 miles. Lieut. Simon, in the French gunboat, *La Grandière*, steamed 900 miles, from Stung-Treng to Luang-Prabang, and reports that at high water the rapids are navigable to Kiang-kong, 220 miles higher up the stream.

SIBERIA. Last summer the veteran Arctic skipper, Captain Wiggins, took 400 tons of English merchandise up the Yenisei to within 180 miles of Yeniseisk. The Russian government admitted the goods free, so as to encourage navigation to Siberia by way of the Arctic ocean.

The completion of the Trans-Siberian railway seems to be assured by the negotiation in Berlin of three Russian railway loans, aggregating $55,000,000. Whether Russia has secured from China authority to cross Manchuria to an ice-free port is yet a mooted question.

AFRICA

ASHANTI. A telegraph line is being constructed from the coast to the interior, along the principal trade route.

EGYPT. A geological survey, to be completed within three years at a cost of £25,000, has been sanctioned by the Khedive. It will be carried out under the direction of Capt. Lyons, R. E.

ABYSSINIA. The Italian army is constructing a good military road between Adowa, Adigrat, and Makaleh. An administration is being established, with a view to promoting colonization.

KONGO FREE STATE. According to the statements of the Rev. John B. Murphy, an American Baptist missionary, who speaks from an experience of several years, the authorities of the Free State are committing shocking barbarities in connection with the exploitation of the rubber trade. The natives, as far as practicable, are abandoning the Belgian for French territory, where they are well treated.

SOUTH AFRICA. The delimitation of the railway strip on the eastern frontier of Bechuanaland is in progress, the survey being made by Colonel Goold-Adams. This delimitation is made under an agreement with the native chiefs regarding the extension of the railway to Matabeleland. The railway company surrenders a subsidy of $1,000,000 for land grants, enhanced police powers, etc., which insures its future control of the trade routes to this region. The Natal-Transvaal railway is now in operation as far as between Durban and Heidelberg, and the section from the latter point to Johannesburg is in process of construction. The heavy spring rains have postponed the opening of the through railway service from Natal to the Rand. The Transvaal is now served by three lines, the others being the Cape and Free State and the Delagoa bay. Telegraph communication between Cape Town and the East Coast is now continuous, through the opening of the line between Umtali and Beira. The necessity of concerting measures to prevent the utter extinction of the African elephant is again being urged. It is said that the Germans are taking steps to protect the few herds remaining in German territory, and it is to be hoped that the British colonial authorities will lose no time in following their example.

THE VALLEY OF THE ORINOCO

By T. H. Gignilliat

United States War Department

In the map of the valleys of the Orinoco and Esequibo rivers, showing Venezuela and British Guiana (Plate V), the territory between the shaded area and the Corentyn river shows the extent of British Guiana as given in a map published by William Fadon, Geographer to His Majesty, January 1, 1820. This country, acquired by the English through conquest and formally ceded to them by the Dutch in 1814, then contained some 20,000 square miles.

The lighter portion of the shaded territory shows the first extension of British Guiana to the west after Fadon's map of 1820. This expansion appears on a map published in London in 1840 by Robert H. Schomburgk, which included the light-shaded area above mentioned, about 40,000 square miles. Schomburgk held an English commission to draw the boundary line, but it does not appear that Venezuela was represented in the survey. The darker portion of the shaded territory shown on Plate V represents the subsequent extension of British Guiana, as shown by a series of many recent publications. Since 1840, maps and other publications have appeared, drawing line after line farther to the west, until some 49,000 square miles have been added to Schomburgk's acquisition. In this way the area of British Guiana has increased from about 20,000 square miles, as shown on the Fadon map of 1820, to 109,000 square miles, the area given in the Statesman's Year-Book of 1895.

Gold was discovered in a new section of this area, to the northwest, in 1884, and an official Venezuelan report places the gold output of this section in 1890 at $1,000,000. But there is a larger interest at stake than all this territory, with all its gold. It is the control of the valley of the Orinoco, an area of about 600,000 square miles, which comprises a very large portion of South America north of the Amazon river.

It is not generally known that the best entrance to the Orinoco river is within the original Schomburgk line. Dr Muñoz Tébar, the successor of Señor José Andrade as president of the state of Zuiia, Venezuela, states, after a personal examination, that the best entrance to the Orinoco river is through the Guaima river and Mora passage to the Barima river, and thence to the Orinoco. Authorities appear to agree that the other mouths of the Orinoco are shallow and obstructed by sand bars. Dr Tébar gives the depth of the Mora passage as over 60 feet, and would lead us to infer that there was no bar at the entrance of the Guaima. If this means that there is a clear channel over 60 feet from the sea through the Mora passage to the Orinoco river, it is a most important piece of information. The square black marks in this locality show the position of English trading stations, established between 1885 and 1887.

In addition to the authorities above quoted, the "commercial" map of F. Bianconi, Paris, 1888, was used in compiling the map on Plate V.

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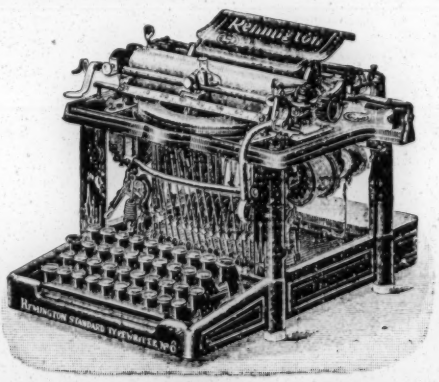

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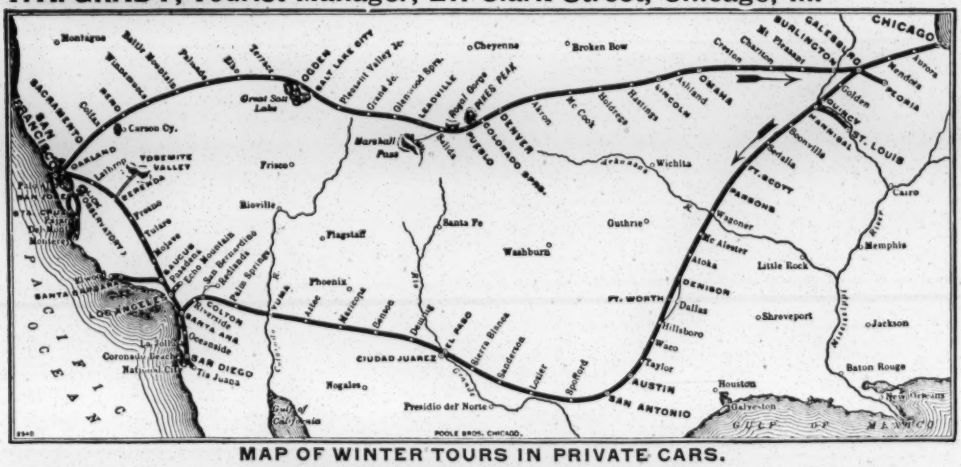

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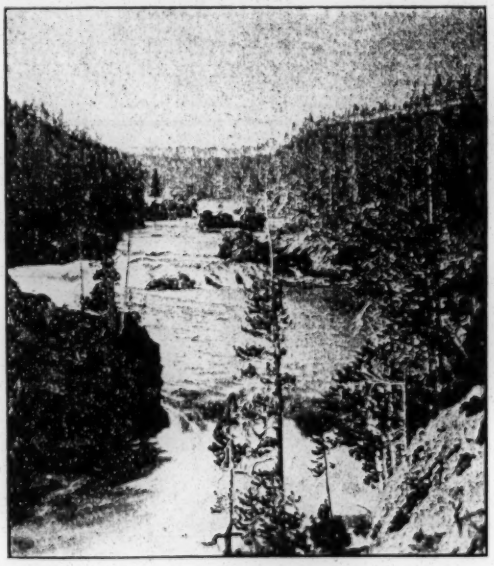

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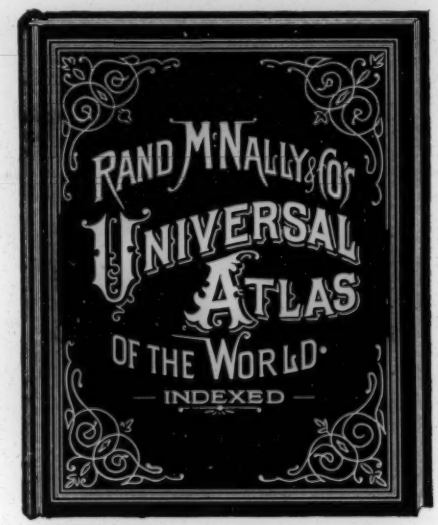

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